

JOINT LEGISLATIVE AUDIT AND REVIEW COMMISSION

The Virginia General Assembly

FINAL DRAFT

**Equity and Efficiency of
Highway Construction
and Transit Funding**

November 29, 2001

JLARC Report Summary

Transportation funding in Virginia is distributed based on multiple formulas used to allocate State and federal highway construction funds. In FY 2002, the formulas were used to allocate State and federal revenues totaling \$3.3 billion. The existing formulas used to allocate most State highway construction funds are almost 20 years old and are based in part on a study conducted by JLARC staff between 1982 and 1984.

In November 2000, the Joint Legislative Audit and Review Commission (JLARC) directed staff to assess the equity and efficiency of funding for highway construction. The Commission directed staff to address whether the allocation of funding among highway systems and among Virginia's localities and regions was equitable and consistent with current and anticipated needs on Virginia's highway system. In May 2001, the Commission directed staff to expand the scope of the review to include an examination of public transit needs and funding. The report addresses the issues raised by the Commission directive.

The current system for allocating construction funding is outdated and needs to be revised to ensure that construction funds are equitably and efficiently allocated. The existing administrative system needs to be replaced with a road classification system based on the functional purpose of the roads, and the VDOT districts need to be replaced with new funding regions for purposes of allocating regional construction funds.

A needs-based system should continue to be used to allocate construction funds. However, VDOT should improve the needs assessment

process and produce one that is accurate and objective. Highway construction funds should be allocated proportionally among the statewide, regional, and local road systems based on need, and within systems the construction funds should be allocated based on factors that serve as good proxies for need, such as registered vehicles and highway mileage. These changes will result in more construction funds for major roads. In addition, a bridge fund should be established to ensure that funding of needed bridge replacements is adequately prioritized.

Based on the projected construction funds and the estimated cost of constructing the projects that have been identified as legislative priorities, there will not be sufficient funds to pay for the projects in the near term. The projected shortfall between Virginia Transportation Act project costs and estimated revenues available for the interstate, primary, and Priority Transportation Fund projects over the next ten years is about \$6.5 billion. This is almost half the estimated project costs. Therefore, under current conditions, it appears unlikely that these projects can be funded in less than a 20-year time frame.

As a result of frustration with the lack of funding for projects and the perceived lack of responsiveness by VDOT, the General Assembly has recently assumed a more active role in the funding process. While the General Assembly's increased involvement has had some important benefits in the near term, the General Assembly may wish to re-examine its long-term role in the process.

This review also examined public transit, which serves as an alternative to automobiles under many circumstances. Transit systems in Virginia are regional or local operations and rely on local government as well as federal and State financial assistance. While transit is growing in Virginia, it is proposed that the State make organizational changes to ensure that the full range of transportation options are being considered to meet growing transportation challenges, especially in the urbanized regions of the Commonwealth.

New Classification System Should Serve as Basis for the Allocation of Highway Construction Funds

The existing system for the allocation of highway construction funds is based on an antiquated and somewhat arbitrary road classification system that is not directly related to the functional purpose of roads, and which does not reflect major changes in the federal funding structure that have occurred over the last several years. As a result, the current system has the following limitations: (1) funds are not allocated to a system of roads of statewide significance, (2) roads with different functional purposes have to compete for the same allocation of construction funds, and (3) funding decisions regarding roads are often not being made by the appropriate decision-makers. For example, Braddock Road in Fairfax County is functionally classified as an arterial road and carries more than 77,000 vehicles a day on some sections but is part of the secondary system. Conversely, Route 84 in Highland County is classified as a collector road and carries only 200 vehicles a day but is part of the primary system.

The current system should be replaced by a system that classifies roads based on their functional purpose. The proposed system should be a

three-tier system with statewide, regional, and local roads. The statewide system would be comprised of the highest-level roads, which would be roads of statewide significance. Virginia's portion of the National Highway System, which is comprised of roads that Congress has designated as significant components of the national highway network, can serve as the basis for the statewide system. The statewide system would include the interstates and major arterials.

The regional road system would consist of all roads that serve a regional functional purpose (primarily those functionally classified as minor arterials). The remaining roads would be classified as local system roads. This would include roads that are local in purpose (functionally classified as collectors and local streets).

A functionally-based classification system would address some of the limitations of the current system as well as improve the allocation process. It would increase the focus on the statewide network of roads and help to ensure that it is adequately funded. In addition, a separate system would help to ensure that regional and local roads are funded in proportion to their needs, like projects are competing for construction allocations, and funding decisions are being made by the appropriate decision-makers. The Commonwealth Transportation Board (CTB) would decide how to allocate statewide system funds at the project level. The CTB would also decide how to allocate regional system funds in coordination with local governments and applicable regional entities such as metropolitan planning organizations where appropriate. Project level allocations of local system funds should be made by local governments.

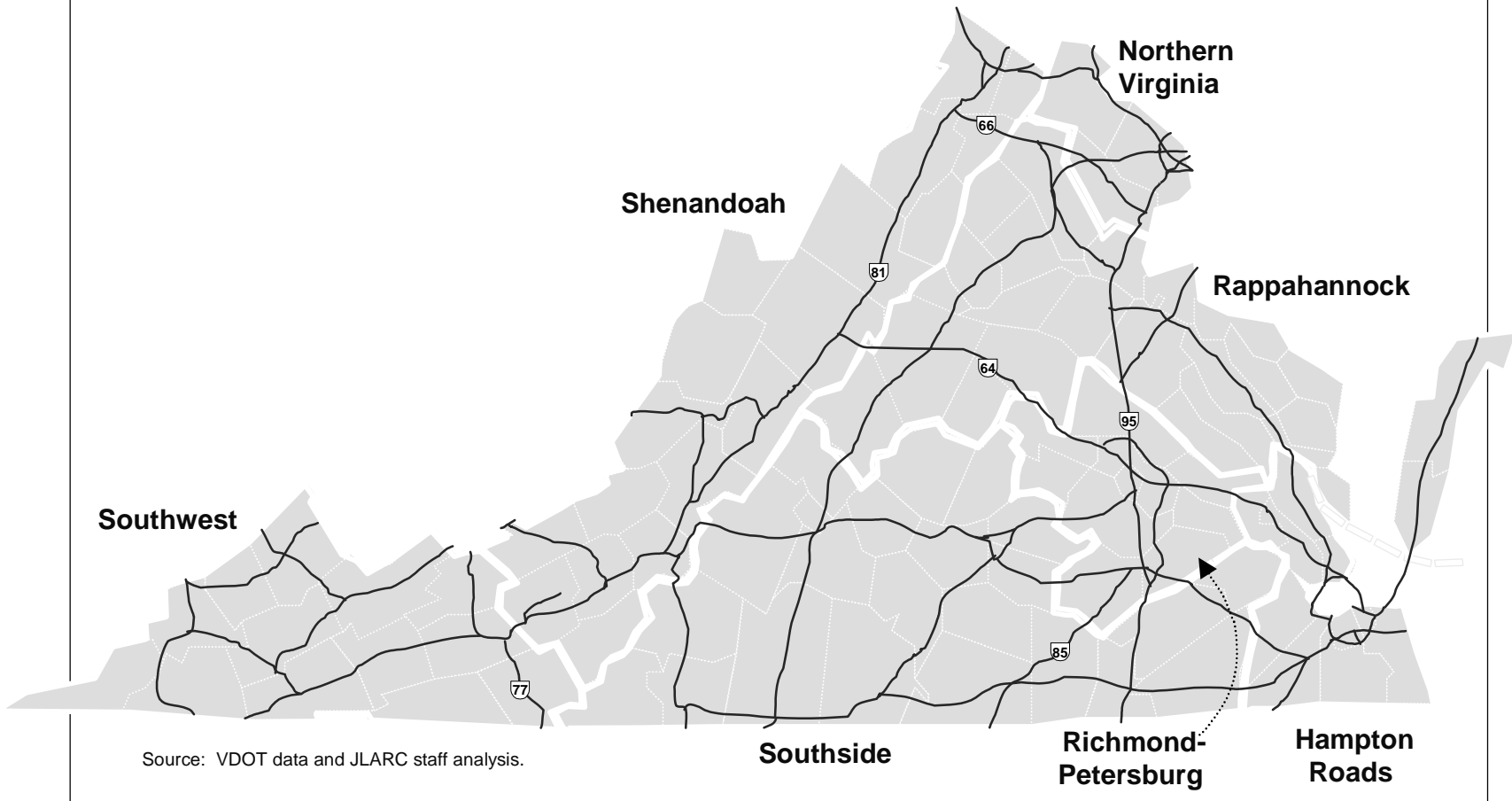
New Funding Regions Should Be Established to Replace Existing VDOT Districts for Purposes of Distributing Regional Construction Funds

Along with the classification of roads based on functional purpose, new funding regions are needed for purposes of distributing regional construction funds. The existing VDOT districts, which are based on Congressional district boundaries established in 1922, are antiquated and arbitrary. New funding regions are recommended for the purpose of distributing regional system construction funds. The regions would be based on metropolitan planning organization boundaries in major urban areas and transportation corridors in other areas of the State. These regions should further promote and facilitate a regional approach to transportation planning and funding with regard to regional roads. The report recommends that CTB members be appointed from the proposed funding regions instead of from VDOT administrative districts. The figure on the next page shows the proposed funding regions and the highways in the proposed statewide system. Over time, VDOT should align its administrative districts with the proposed funding regions.

VDOT Should Adopt an Objective and Accurate Needs Assessment

The initial purpose of the highway needs assessment was to determine the proportional allocation of construction funds among systems and to test factors that could be used to serve as proxies for need for the purpose of distributing funds within systems. In recent years, the requirement that VDOT conduct a quinquennial needs assessment has become controversial. Based on interviews with transportation officials and responses received from local

Proposed Statewide Highway System Shown in JLARC Staff-Proposed Funding Regions



governments, it is apparent that very few – even among transportation professionals – understand how the highway needs assessment was used to develop the current formulas. Many appear to view the assessment as a tool for assessing the adequacy of funding. In addition, much of VDOT's leadership team appears to be unaware of the original purpose of the needs assessment the department is required to conduct.

As a result, VDOT has been reluctant to fulfill the legislative requirement that the quinquennial needs assessment be developed and released. This low priority assigned to the needs assessment has resulted in an assessment that is inadequate to fulfill the purposes for which the needs assessment requirement was enacted. The most recent needs assessment has numerous shortcomings, including use of outdated data and criteria for measuring need, decisions based on subjective judgments, and a questionable process for calculating the costs of deficiencies. In most cases, available and updated traffic data had not been added to the database since 1994. In addition, an initial examination of the database uncovered more than 2,300 instances in which congestion deficiencies were identified, but no solution was proposed to address the deficiency. Conversely, many improvements were added to the needs assessment that did not address deficiencies based on engineering standards, because staff knew that projects were planned or under consideration on a particular route. Adding further subjectivity to the process was the fact that these inclusions or exclusions were done by different people for different regions

of the State; thus there was no consistency even within the use of subjective professional judgment.

In order to fulfill the legislative intent of the needs assessment requirement, VDOT needs to develop an objective needs assessment that is based on objective criteria. The Federal Highway Administration (FHWA) has developed a model which is used to develop a national needs assessment that could also be used to develop a State needs assessment. This model, which is referred to as the Highway Economic Requirements System (HERS), has been developed and improved by FHWA over 20 years. The U.S. General Accounting Office, as well as a team of economists assembled by the FHWA, has concluded that it is an effective tool for measuring construction need, and two states are currently using the model to assess their state needs.

The HERS model could be used to conduct an objective needs assessment of Virginia's transportation needs. The HERS software identifies deficiencies and then selects improvements based on cost-benefit analysis. It would eliminate the subjective aspects of the VDOT needs assessment and the perception that the needs assessment is merely a wish list. In addition, the data would be easier to collect and could be regularly updated. The report includes a recommendation for the General Assembly to consider amending the *Code of Virginia* to require that VDOT periodically conduct a needs assessment using HERS or an equivalent model.

Almost Three-Fourths of Construction Funds Should Be Allocated to the State and Regional Systems

Highway construction funds should be allocated among road systems based on the proportion of needs on each system. Based on the HERS analysis, almost 40 percent of the needs identified are on the statewide system, one-third are on the regional system, and just more than a quarter of the needs are on the local system. The table below shows the proportional needs on each system.

Currently, there are multiple formulas for the allocation of State and federal construction funds, and most federal funds are not allocated based on the State's proportional formula. With most federal funds allocated outside of the needs-based formula, there is no mechanism in place to ensure that construction funds as a whole are allocated proportionally based on need. In the future, most federal and all State funds should be combined for purposes of allocating funds among road systems to ensure that funds are allocated based on need.

Proportional Highway Construction Needs of Statewide, Regional, and Local Systems		
<u>System</u>	<u>Ten-Year Needs</u>	<u>Proportional Needs</u>
Statewide	\$14,327,996,710	39.4%
Regional	12,130,480,595	33.3%
Local	9,956,838,446	27.3%
Total	\$36,415,315,751	100%
Source: JLARC analysis of HERS/ST ten-year needs assessment and federal bridge sufficiency criteria.		

Statewide System Funds Should Be Allocated Based on Project Priorities and Regional and Local System Funds Should Be Allocated by Formula

Statewide system funds should be allocated on a project-by-project basis by the CTB according to the priority of statewide system needs. Regional and local funds should be allocated among regions and localities by formulas that include factors which serve as proxies for need. Based on an analysis of the relationships between various proxies and system needs, total registered vehicles appears to be the best proxy for need in allocating regional system funds. In contrast, using a combination of centerline miles (road length) and total registered vehicles appears to be the best proxy for predicting need on the local system. Based on the statistical analysis, the local system distribution formula should be based 86 percent on centerline miles and 14 percent on total registered vehicles.

Proposed Formulas Substantially Impact Allocations

The proposed changes to the allocation formula would impact substantially the allocation of highway construction funds. The changes would have this impact because of shortcomings in the current system. The current classification system is outdated and arbitrary to some extent, and the current formulas no longer allocate funds based on existing needs. Therefore, the proposed new allocation system, which would classify roads based on functional purpose and would allocate construction funds based on need, inevitably would change the distribution of funds considerably. With the greatest needs on major roads, the proposed formula would allocate a larger proportion of funds to these roads, and less funds to local roads which have fewer needs. In addition, the

formulas would allocate more regional funds to urban areas, which have greater regional road needs, and more local funds to rural localities, which have greater local road needs.

Separate Bridge Fund Is Needed and Bridge Replacements Should Have Higher Priority

A substantial number of Virginia's bridges have poor sufficiency ratings and need to be replaced. Approximately 1,300 bridges are currently eligible to be replaced under federal funding guidelines because of low sufficiency ratings, and an additional 1,300 bridges will need to be replaced within ten years. The table below shows selected deficient bridges around the State and the volume of traffic they carry.

Examples of Severely Deficient Bridges				
Bridge	Location	Rating*	Average Daily Traffic	Year Built
E. Hawthorne Street over C&O Railroad	Danville	0.0	3,337	1900
Route 58 over North Mayo River	Henry	0.0	6,521	1955
Washington Blvd over Columbia Pike	Arlington	2.0	67,000	1944
Huguenot Road over James River	Henrico	3.3	29,832	1949
Fall Hill Avenue Extension over Old Rappahannock Canal	Fredericksburg	6.4	5,165	1950
*Key: 81-100 – Bridge is in acceptable condition. 51-80 -- Bridge eligible for federal rehabilitation funds. 50 and below – Bridge eligible for federal replacement funds. Source: JLARC staff analysis of VDOT Bridge Division data.				

Even though a large number of Virginia's bridges are considered deficient, Virginia does not have a State fund reserved for bridges, nor does it program federal bridge funds to areas based on their bridge needs. Instead, the federal bridge funds Virginia receives each year flow through the overall State highway construction formula. VDOT's decision to prioritize road construction over bridge improvements has led to the transfer of about \$289 million of federal bridge funds away from bridges for use on road projects over the past decade.

This year, Virginia did not use the full amount of federal bridge funds that it was apportioned for bridge replacements and therefore will be penalized next year as a result. The penalty will be a lower bridge apportionment and the inability to access the federal bridge discretionary program, which Virginia has taken advantage of to obtain additional federal funds in the past. Although it is not possible to calculate the exact amount of the penalty pending resolution of the federal budget process, Federal Highway Administration staff estimate that it will be almost \$13 million.

One of the reasons that bridge funds are not fully used despite the number of deficient bridges is the high cost of bridge projects relative to other types of highway projects. This cost limitation is particularly burdensome for localities that have to fund bridge replacements from their secondary and urban allocations.

In order to facilitate and improve the funding of and prioritization of bridge replacements, this report includes a recommendation to establish a State

bridge fund using federally allocated bridge funds, and to distribute such funds using a priority system based on severity of deficiency.

Estimated Future Funding Appears to Be Inadequate to Fund Identified Projects

Based on projected revenues, there is not likely to be sufficient funding to construct the Virginia Transportation Act (VTA) projects in the next ten years. In fact, these projects can only be funded in 20 years if the cost of the projects does not increase substantially. The remaining cost of the VTA projects, excluding prior allocations for them, is estimated to be \$14.2 billion. The funding shortfall between the projected cost estimates for these projects and projected available construction funds over the next ten years is \$6.5 billion after projected secondary and urban allocations are made. This shortfall is more substantial if the interstate and primary projects currently in the six-year plan, but not in the VTA, are also included in the analysis. The remaining cost of these projects is estimated to be approximately \$1.4 billion. Therefore, the funding shortfall between projected construction funds available in the next ten years (after secondary and urban allocations) and the total estimated cost of VTA and other six year plan projects is almost \$8 billion. Over 20 years, virtually all of the funds projected to be available for interstate and primary construction (including projected PTF funds) would be needed to pay for the VTA and other six-year plan projects. The table below shows a comparison of estimated costs of VTA and six-year plan project costs with funds projected to be available for construction. Based on the JLARC staff review of project costs conducted

Comparison of Estimated VTA and Six-Year Plan Project Costs with Forecast of Available Construction Funds			
Funding Available		Total VTA Project Costs	(Revenue Gap) or Remaining
10-Year	All Systems Construction Funds: \$12.1 billion	\$15.6 billion	(\$3.5 billion)
	Funds After Secondary and Urban Allocations: 7.7 billion	\$15.6 billion	(\$7.9 billion)
20-Year	All Systems Construction Funds: \$26.4 billion	\$15.6 billion	\$10.8 billion
	Funds After Secondary and Urban Allocations: \$16.2 billion	\$15.6 billion	\$0.6 billion
<p>Note: Construction funds does not include special program funding allocated subject to requirements imposed by State and federal law. Costs refer to the amount unfunded as of FY 2002. Projects included are all VTA projects, and all non-VTA interstate and primary system six-year plan projects. The cost estimate only takes into account inflation to the extent that VDOT incorporated inflation estimates for work to be done within the next six years.</p> <p>Source: JLARC staff analysis of VDOT project cost estimates and DMV and VDOT revenue forecast data.</p>			

last year, this analysis may understate the gap in funding substantially, because the ultimate cost of these projects is likely to be far greater than the current cost estimates provided by VDOT.

Another indication of a potential gap in funding is the analysis conducted as part of the development of the Northern Virginia 2020 plan. The 2020 Plan, which was developed by elected officials in Northern Virginia with the assistance of VDOT, was released in December 1999 and is the regional roadmap for priority transportation improvements needed in the region within the next 20 years. Based on revenue forecasts completed as part of the plan, and the estimated cost of projects identified in the plan, there will be a \$13 billion shortfall in revenue needed to complete the highway and transit project priorities identified in the plan over the next 20 years.

Virginia Transportation Act Needs Revision

The General Assembly's frustration with the lack of project funding, and VDOT's perceived unresponsiveness to the legislature, led to the General Assembly's decision to address shortcomings with the process for selecting and funding construction projects. The VTA has served several important purposes. The VTA alleviated the serious cash flow shortage being experienced by VDOT by providing approximately \$500 million in general fund dollars for transportation construction so that the development of these delayed projects could be resumed. In addition, the VTA gave the CTB statutory authority to issue federal revenue anticipation notes, which served to accelerate the receipt of federal construction funds. The VTA also established the insurance license tax as another dedicated revenue source for transportation.

While the VTA has served these important purposes, it also has complicated the funding process by reducing VDOT's programming flexibility and minimizing the Commonwealth Transportation Board's traditional authority to prioritize and select projects for construction. In addition, over the long term the Priority Transportation Fund may not fully address one of the fundamental concerns for which it was created – the lack of funding for major road projects.

Consistent with the General Assembly's concerns, the legislature should have an increased role in the process through direct appointment of the at-large members to the CTB. The report recommends that the General Assembly revise its role in the process and consider restoring the CTB's role in project selection. This can be accomplished by amending the VTA to remove those provisions that limit the CTB's flexibility to program construction revenues

made available by the VTA in accordance with the State allocation formulas. The report further recommends that the General Assembly give itself the authority to appoint the at-large members of the CTB.

**Intermodal Transportation Planning Is Needed to
Ensure Informed Funding Decisions**

Intermodal transportation planning is currently limited in Virginia, yet challenges in the movement of people and goods appear to increasingly require consideration of intermodal solutions. With multimodal alternatives available to meet transportation demand and limited transportation funds available, it will become increasingly important for transportation policy makers to receive professional analysis and recommendations regarding intermodal transportation issues. Currently, there are no staff outside the transportation agencies to provide this analysis and advice to the CTB. The report includes a recommendation to establish a separate office within the transportation secretariat with responsibility for providing the Secretary of Transportation and the CTB with professional analysis and recommendations regarding intermodal transportation issues.

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I. Introduction

In November of 2000, the Joint Legislative Audit and Review Commission (JLARC) directed staff to assess the equity and efficiency of funding for highway construction and maintenance. At its May 2001 meeting the Commission expanded the scope of the review by directing staff to also evaluate transit needs and funding. As a result, JLARC staff undertook two studies – one focusing on highway maintenance and the second examining the equitable distribution of highway construction funding and funding for transit. This report presents staff findings in the area of funding for highway construction and transit.

In its November 2000 study request, JLARC directed staff to address the following two questions as part of its review of transportation funding:

1. Is the allocation of funding among highway systems and special programs equitable, and consistent with the current and anticipated needs on Virginia's highway system?
2. Is the allocation of highway system funding among Virginia counties, cities, towns, and regions equitable, and consistent with the current and anticipated needs on Virginia's highway system?

This study presents findings relating to these two questions and evaluates other issues that impact the distribution of funding among the systems of roadways, regions of the State, localities, and between highways and transit.

TRANSPORTATION FINANCE IN VIRGINIA

Titles 33.1 and 58.2 of the *Code of Virginia*, along with the State Appropriation Act, set forth the revenues dedicated to transportation and how they are allocated. VDOT is a non-general fund agency, and State transportation funding is comprised primarily of dedicated highway user fees. Overall, revenues

Exhibit 1

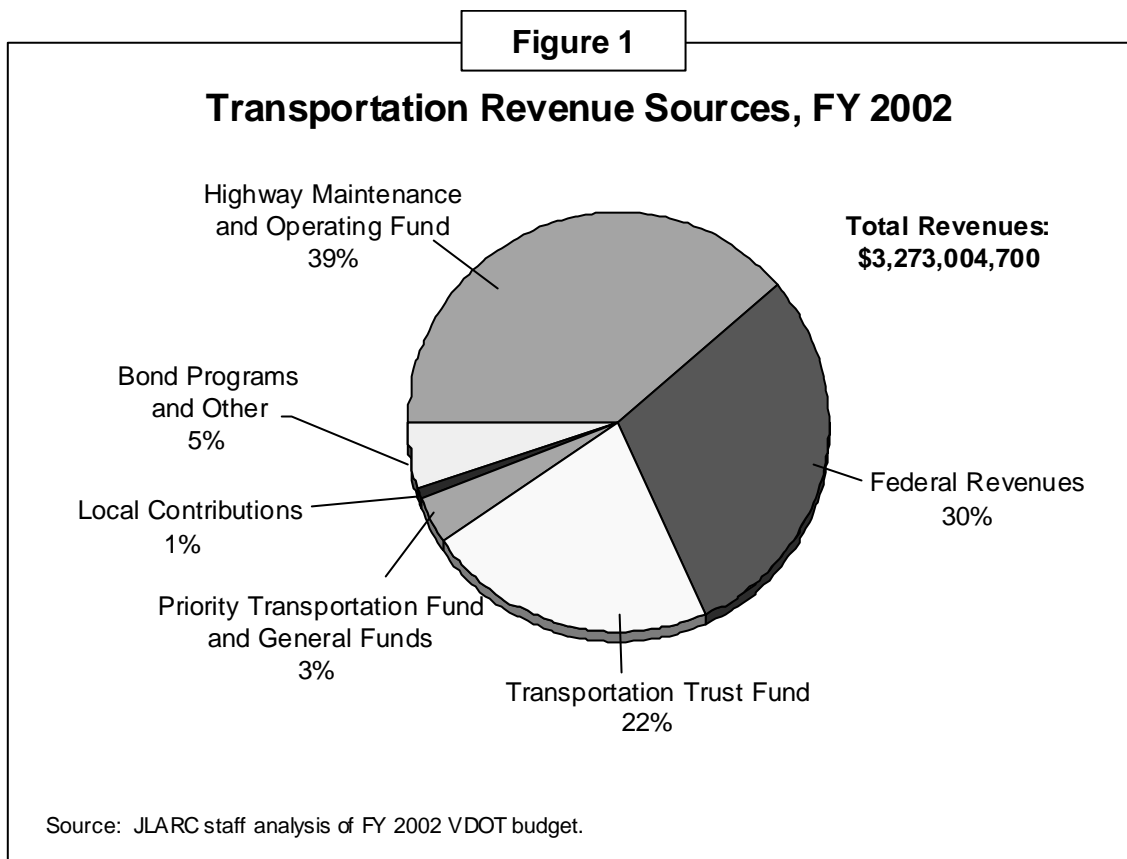
Glossary of Terms

CMAQ	Congestion Mitigation and Air Quality
COT21	Commission on Transportation for the 21 st Century
CTB	Commonwealth Transportation Board
DMV	Department of Motor Vehicles
DRPT	Department of Rail and Public Transportation
FHWA	Federal Highway Administration
FRANs	Federal Revenue Anticipation Notes
FTA	Federal Transit Act
GAO	General Accounting Office
HBRR	Highway Bridge Replacement and Rehabilitation
HERS	Highway Economic Requirements Systems
HERS/ST	HERS State level
HMOF	Highway Maintenance and Operating Fund
HPMS	Highway Performance and Management System
IM/NHS	Interstate Maintenance/National Highway System
MPO	Metropolitan Planning Organization
MTF	Mass Transit Fund
NHS	National Highway System
PTF	Priority Transportation Fund
STP	Surface Transportation Program
TCC	Transportation Coordinating Council
TEA-21	Transportation Equity Act for the 21 st Century
TTF	Transportation Trust Fund
VDOT	Virginia Department of Transportation
VMT	Vehicle Miles Traveled
VTa 2000	Virginia Transportation Act 2000
VTDP	Virginia Transportation Development Plan
WMATA	Washington Metropolitan Area Transit Authority

for FY 2002 from State, federal and other sources totaled \$3.3 billion. Figure 1 depicts the sources of these revenues.

Separate Formulas Used to Allocate State and Federal Revenues, and Revenues for the Various Modes

Transportation funding in Virginia is not allocated using one formula. Instead, separate formulas are used to allocate State and federal funds, to distribute monies to highways, transit, and other modes, and to allocate funds within specific highway and transit programs. Under Virginia law, State and federal funds have largely been considered discrete funds, and State allocations among the systems are made largely without consideration of where federal



funding is spent. In addition to the already complex mix of State and federal formulas, the Virginia Transportation Act of 2000 (VTA) created new highway programs and specified how much of the funding supporting these programs is to be distributed. These requirements are in addition to the previously established State distribution formulas. The rules governing the use of traditional State highway funds, federal highway funds, and the new VTA funding are described below.

State Highway Revenues

State transportation revenues are anticipated to be \$2.24 billion in FY 2002 and comprise approximately 68 percent of the total funds in VDOT's budget. These revenues are deposited primarily into two accounts: the Highway Maintenance and Operating Fund (HMOF) and the Transportation Trust Fund (TTF). The HMOF was the repository for all State highway funding from 1923 until 1986 when the General Assembly created the Transportation Trust Fund to provide funding specifically for highway construction.

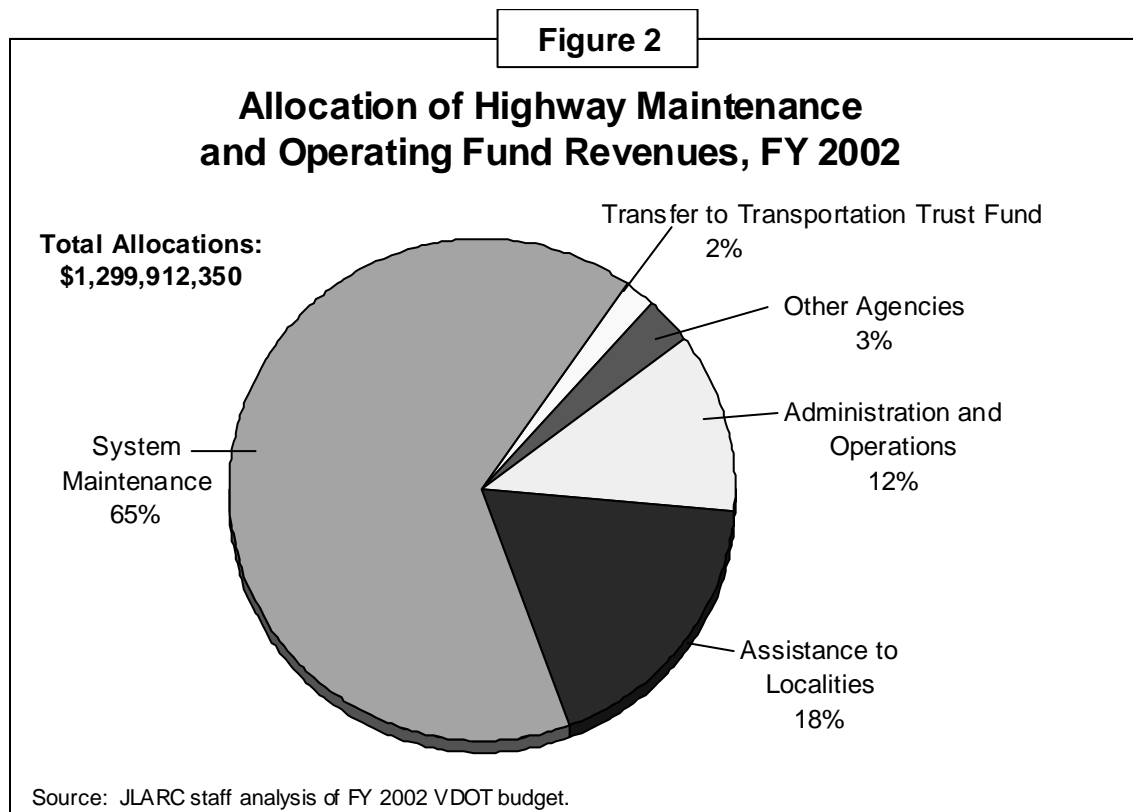
Title 33.1 of the *Code of Virginia* and the Appropriation Act outline how all highway revenues must be allocated. Section 33.1-23.1 stipulates the following priority order for funding VDOT programs and activities:

1. maintenance,
2. payments to localities,
3. administration and operations, and
4. highway construction.

Highway Maintenance and Operating Fund. In FY 2002, State HMOF revenues totaled \$1.3 billion. VDOT systems (interstate, primary, and

secondary) maintenance allocations totaled \$848 million, 65 percent of the total revenue available. An additional \$236 million of HMOF funding is allocated to localities for the maintenance of qualifying city streets and county roads. Administration of VDOT will cost \$113.5 million, and operational activities will require an additional \$35.3 million. After these activities are funded “off the top” of the budget, all remaining funds will be transferred to the TTF and allocated to highway construction projects. Figure 2 depicts the allocation of HMOF revenues in FY 2002.

When the TTF was created in 1986, it was considered the capital improvement fund, and the HMOF was seen as the maintenance and operations fund. However, over time the proportion of available revenues required to fund maintenance and operations has increased steadily. In FY 2002, these costs will



require almost all the HMOF revenues, and VDOT staff project TTF revenues will be required to help support maintenance and operations costs in latter years of the current six-year development plan.

Transportation Trust Fund. The TTF is funded largely from revenue source increases enacted in 1986: portions of the State fuel tax, the motor vehicle sales tax, vehicle registration fees, and one-half of one percent of the State general sales and use tax. Unlike the HMOF, which is dedicated to highways, the TTF funds four modes of transportation in Virginia: highways, mass transit, ports, and airports. Today, the funding from the TTF is distributed to the four modes as follows:

- highways: 78.7 percent
- mass Transit: 14.7 percent
- ports: 4.2 percent
- airports: 2.4 percent

TTF revenues total \$724 million in FY 2002, approximately \$568 million of which is available for highway construction after funds are distributed to the other modes.

The total VDOT highway construction program – which includes planning, engineering, right-of-way acquisition, and construction of Virginia's road and surface transportation network – amounts to \$1.65 billion for FY 2002. This program is funded through a combination of sources, namely the highway portion of the TTF, any funds remaining from the HMOF after maintenance and operations are funded, and federal-aid highway apportionments. Of the \$1.65 billion construction program in FY 2002, approximately \$974 million is allocated

to the interstate, primary, secondary and urban systems as required by State law. Section 33.1-23 of the *Code of Virginia* directs State construction funds to be allocated as follows:

- any required match for the federal interstate funds first,
- 5.67 percent of the remainder to unpaved secondary roads, and
- of the remainder,
 - 40 percent to the primary system,
 - 30 percent to the secondary system, and
 - 30 percent to the urban system.

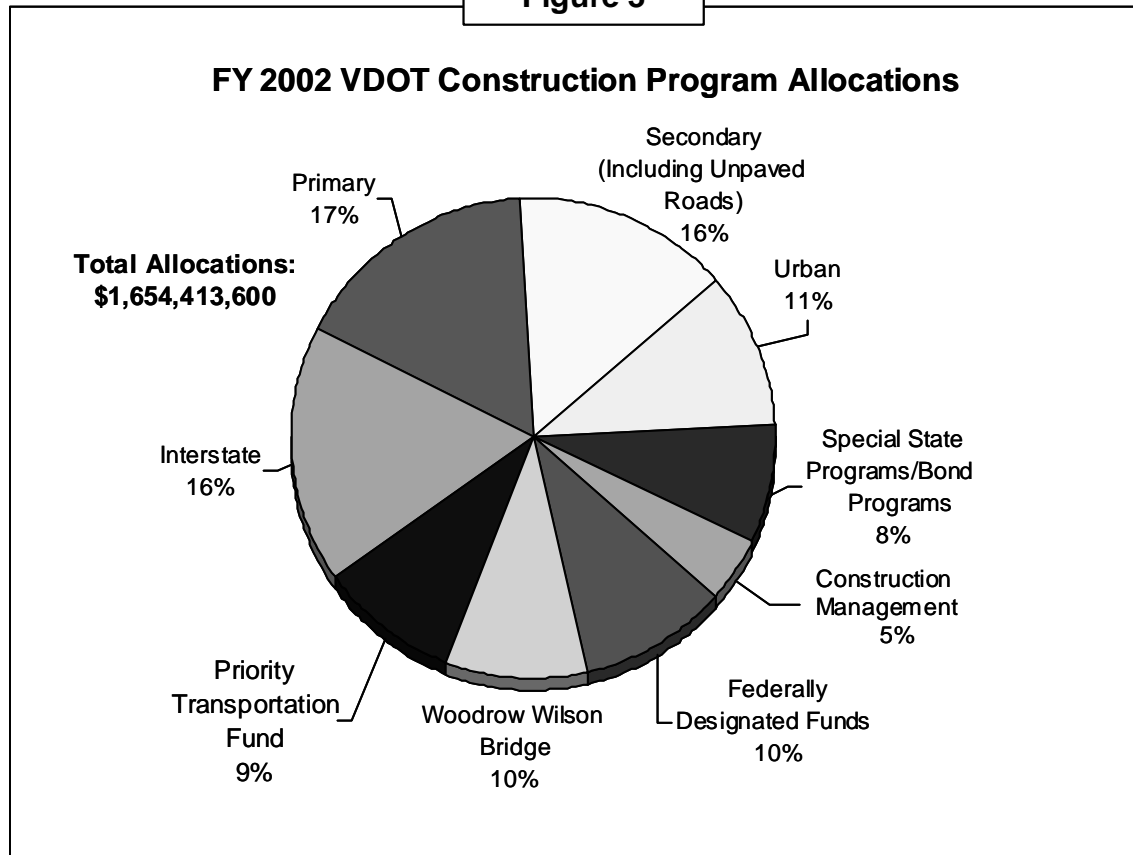
For each of the three administrative systems, the funds are further allocated by a formula in the *Code of Virginia* to highway construction districts (in the case of the primary system) and localities (in the case of the secondary and urban systems). The remaining construction funds are allocated for construction management, special corridor programs, and federally defined programs in accordance with federal regulations, as discussed below. Figure 3 depicts the distribution of highway construction funds in Virginia.

Federal Highway Revenues

In FY 2002 VDOT anticipates receiving \$972 million in federal-aid highway apportionments, approximately 30 percent of the department's \$3.3 billion total budget. Although federal funds provide less than one-third of the agency's overall budget, in FY 2002 these funds comprise almost 60 percent of VDOT's \$1.65 billion construction budget.

Virginia's Use of Federal Funds. Even though federal funds make up the majority of VDOT's construction budget, there is no language in the *Code of Virginia* governing how VDOT allocates most federal funds, nor are they

Figure 3



considered when determining the proportion of funds allocated to each roadway system. Section 33.1-23 provides for the use of State funds to match federal interstate funds, but no other federal highway programs are mentioned. In part this is because of the changing nature of federal programs – the General Assembly did not wish to have to amend the *Code* repeatedly to allow VDOT to respond to changing federal programs. In recent years, the Appropriation Act has governed how VDOT distributes these funds on an annual basis. Further, federal law itself dictates to a certain extent how federal highway funding must be allocated. However, excluding consideration of where federal funds are allocated when distributing State transportation funds results in an overall distribution of funding that may not reflect the distribution of construction needs.

Federal highway apportionments have increased substantially in the past ten years. In particular, the passage of TEA-21 in 1998 resulted in an increase in federal funding of approximately \$250 million per year for Virginia. There have been no increases in the State highway revenue streams since 1986. As a result, federal funding has increased from 32 percent of VDOT's total highway acquisition and construction budget in FY 1990 to almost 60 percent of that budget in FY 2002. Because of the sizeable increase in federal funding in 1998, it is not anticipated that the overall federal program will grow substantially in the coming years.

Transportation Equity Act for the 21st Century. The current federal legislation authorizing funding for state transportation programs is the Transportation Equity Act for the 21st Century, or TEA-21. This legislation governs highway funding for the six fiscal years 1998 through 2003. TEA-21 includes five major programs for highway funding: Surface Transportation (STP), Interstate Maintenance/National Highway System (IM/NHS), Minimum Guarantee, Bridge Replacement and Rehabilitation, and Congestion Mitigation and Air Quality (CMAQ). There are other smaller special programs, as well as the "high priority projects" category, which includes project-specific grants.

Surface Transportation Program (STP). Each of the programs contain federally established distribution and use requirements of varying complexity. The most complex of these formulas is the one for the STP program, although in terms of overall flexibility, these funds can be used on the widest variety of projects. Under federal law, ten percent of STP funds are set aside for safety

programs, and ten percent for so-called “enhancement” projects. Federal law requires 50 percent of the total to be distributed to localities based on federal population data. The remaining 30 percent can be allocated in any manner by the State. The General Assembly, through the Appropriation Act, chose to transfer 80 percent of this remaining amount (24 percent of the total STP funds) to the State allocation formula, and the remaining 20 percent (six percent of the total STP funds) to mass transit in FY 2001 and 2002.

Interstate Maintenance (IM)/National Highway System (NHS). The IM/NHS program is used for improvements to roadways on the interstate and National Highway Systems. The NHS is a system of roads designated by Congress in 1995 as roads of national significance and includes the entire interstate system. There are no federal requirements except that these funds be used on these roadways. Virginia allocates the majority of these funds to NHS and interstate projects selected by the Commonwealth Transportation Board (CTB). There is no geographic subdistribution of these funds. Federal law allows up to 50 percent of this funding category to be transferred to other, more flexible categories. The General Assembly has chosen to transfer a portion of its IM/NHS apportionments - \$37 million in FY 2002 – to the State formula, a provision included in the Appropriation Act.

Minimum Guarantee. The Minimum Guarantee program is a new program under TEA-21 that apportions additional funding to the states (Virginia among them) that do not receive at least a 90.5 percent return on their highway trust fund contributions. Half of these funds are placed in the major program

categories before Virginia receives its apportionments. The remaining 50 percent can be used for any purpose. The General Assembly has elected to direct ten percent of these funds to transit projects, and the remainder is allocated through the State formula. The General Assembly has given the CTB the discretion to allocate some of the non-transit portion of these funds to particular projects, as long as these actions are reported to the House Appropriations and Senate Finance committees.

Highway Bridge Replacement and Rehabilitation (HBRR). VDOT allocates the federal HBRR funds through the State formula, similar to the minimum guarantee funds. Although federal requirements state that these funds must be used on bridge projects (or the State is penalized financially), VDOT does this on a programmatic basis. In other words, as long as VDOT spends at least an amount equal to its bridge allocation on bridges somewhere in the State, VDOT meets federal requirements for the use of these funds.

Congestion Mitigation and Air Quality. The fifth major category of federal highway funding is Congestion Mitigation and Air Quality (CMAQ). These funds are allocated to states to address deficient air quality. Nationally, these funds are apportioned based on population and severity of air quality problems in those metropolitan areas with nonconforming air quality. Virginia currently receives funding for this program because of air quality deficiencies in three metropolitan areas – Northern Virginia, Hampton Roads and Richmond. Although the federal government apportions these funds among the States based on air quality by metropolitan area, there is no requirement that States

suballocate these funds to the metropolitan planning organizations (MPOs) in those areas. However, following the creation of this program in 1991, VDOT made the policy decision to suballocate these funds to the MPOs.

The 2000 Virginia Transportation Act (VTA)

In addition to the extensive requirements of the traditional State highway formulas and of the federal funding, the Virginia Transportation Act (VTA), enacted by the 2000 General Assembly session, added another layer to the allocation process. The VTA was enacted to provide funding to accelerate some high priority projects and to return some delayed projects back to their previous schedule. The VTA provided \$473 million of general funds over six years to supplement a group of projects that had been delayed because of cash shortfalls. For projects receiving general funds, the VTA designated specific amounts to be received by the projects annually between FY 2001 and FY 2006.

In addition, the VTA established two mechanisms for accelerating 121 high priority projects identified in the legislation. First, the Act authorizes the use of federal revenue anticipation notes (FRANs). FRANs are bonds issued to raise funds for highway construction that are to be repaid from future federal highway reimbursements. The Department's financing plan anticipates the issuance of FRANs totaling \$1.2 billion within six years to accelerate federal funding for highway construction. The bonds have a maximum term of ten years, and future federal transportation funds are to be used to pay the debt service. The CTB issued the first \$375 million in bonds in October 2000. The VTA also established the Priority Transportation Fund (PTF). Revenue directed to the PTF comes

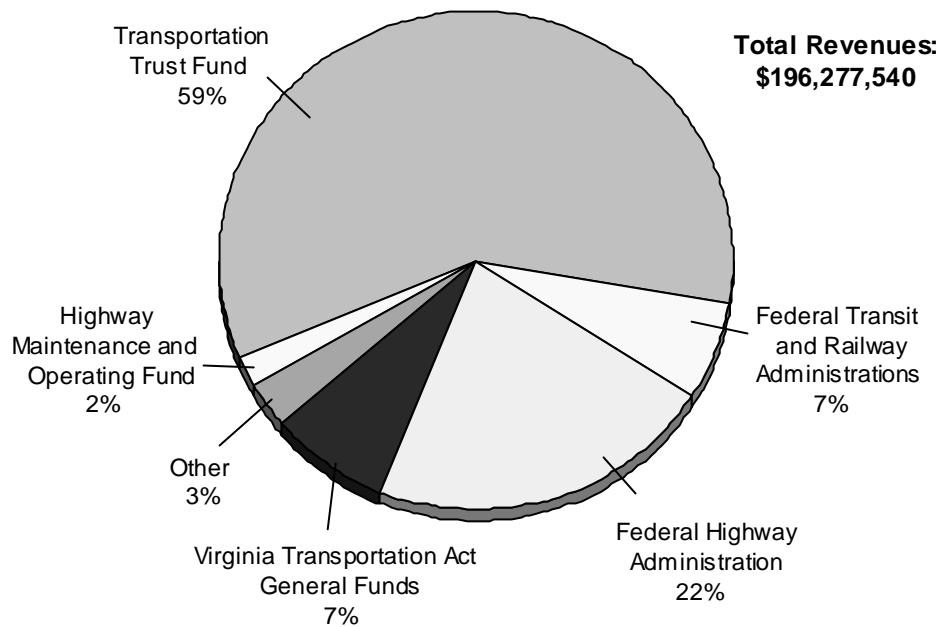
from a variety of new and existing revenue sources, including revenues generated by changing the point of collection of the motor fuels tax from the distributor to the wholesaler level, TTF and HMO revenue in excess of forecasts, and vehicle insurance taxes.

The language of the VTA also specified an amount that could be made available for each of the identified priority projects from FRANs or the Priority Transportation Fund. However, the amount of funding approved for these projects only finances a small portion of the total costs. To complete the PTF projects, VDOT will have to use funding from other revenue sources. VDOT has prioritized these projects in the allocation of funds above all others.

Public Transportation Funding

Like highways, public transportation in Virginia is funded by a combination of State, federal, and local sources. However, transit systems are locally owned and operated and receive a smaller proportion of their funding from State sources. As such, the proportion of costs borne by State, local, and federal sources is different for each transit property in Virginia. Figure 4 depicts the source of revenues that make up the Department of Rail and Public Transportation (DRPT) budget in FY 2002. Although this depicts the level of State commitment to transit and the relative distribution of State funding among transit programs, it provides only a partial picture of transit finance in Virginia.

State Funding. In addition to providing funding for highways, 14.7 percent of the TTF is used to support public transportation services in Virginia. These funds are placed in what is called the Commonwealth Mass Transit Fund

Figure 4**DRPT Revenue Sources, FY 2002**

Source: JLARC staff analysis of FY 2002 DRPT budget.

(MTF). In FY 2002, about \$108 million was provided from the MTF for transit activities. The revenues of the MTF support three major programs: The State formula assistance program, which makes up 73.5 percent of total funding; the State capital assistance program, which makes up 25 percent of the funds; and the State special projects program, which uses the remaining 1.5 percent of State funds.

State formulas dictate distribution of the majority of these funds. In both the operating and capital programs, DRPT can fund up to a certain percentage of a transit system's cost in any given category. Funds are distributed in proportion to each provider's share of reported need. In recent

years there has not been sufficient funding to provide the level of support allowed under State law.

Federal Funding. Transit funds come to Virginia from more than 14 different federal programs, each with different eligibility and use requirements. Three programs provide the bulk of ongoing support for the transit properties in Virginia: the fixed guideway modernization program (used for rail systems), the urbanized area program, and the nonurbanized area program. Funding for the large urban areas is provided directly to the transit providers. In the case of the small and nonurbanized areas, DRPT distributes the funds.

In addition to the traditional sources of federal funding that are dedicated only to transit, a portion of the funds allocated by the Federal Highway Administration (FHWA) can be used for transit projects. In particular, CMAQ and STP regional funds often are allocated by the MPOs to support transit projects in their regions. Many other federal highway administered funds are eligible for use on transit projects, including STP, Minimum Guarantee, and in certain cases, NHS funding.

Local Funding. Local revenues, in the form of either local government support or fare box revenues, support a much larger share of the costs of providing public transportation services in Virginia than they provide for highways. In particular, local and fare box revenues finance a sizeable portion of transit operating costs. In contrast, local governments directly fund a much smaller proportion of the cost to maintain highways.

PRIOR STUDIES

Several studies have examined the issue of the allocation of highway maintenance and construction funds. From 1982 to 1984, JLARC conducted a review of the “reasonableness, appropriateness, and equity of the current statutory provisions for allocating highway construction funds.” In the course of conducting this multi-year study, JLARC staff defined equity as the allocation of highway construction funds according to relative highway construction needs. JLARC did not recommend linking the allocation of highway construction funds within these systems directly with need. Instead, staff used the results of a needs assessment to find surrogates or proxies for need. Staff examined such factors as population, vehicle miles traveled, and land area to evaluate which local characteristics had the strongest relationships to highway construction needs. Those factors were then used to develop models for allocation formulas for each of the road systems. The recommendations in that study served as the basis for major changes to the allocation of highway construction funds enacted in 1985. The formulas have not been adjusted since that time.

In 1991, the General Assembly directed VDOT, pursuant to Senate Joint Resolution 188, to study the Transportation Trust Fund allocation formulas. The study, which was completed in March 1993, concluded that adjustments to the formulas needed to be made to restore equity to the allocation system. The study concluded that the proportion of funds allocated to the primary, secondary, and urban systems needed to be adjusted to provide more funds to both the primary and secondary systems. The study also recommended adjustments to the weighting of factors used to allocate primary funds to construction districts

and secondary funds to counties to more equitably distribute funds. The recommendations from the study were not implemented.

In 1996, House Joint Resolution 160 established the Commission on the Future of Transportation and directed it to examine transportation needs in the State. The emphasis of the study was transportation needs in relation to the adequacy of funding. The study reported that revenues would be inadequate to meet needs as defined by the Commission.

JLARC REVIEW

This JLARC review of the equity and efficiency of transportation funding has involved an assessment of highway construction needs, factors that best reflect the distribution of needs, the systems to which funds are distributed, the adequacy of overall funding, the impact of the VTA, and how transit is funded within Virginia's transportation financing system. A number of research activities were undertaken as part of this study to address these issues. These activities included: structured interviews, analysis of VDOT's 2001 quinquennial needs assessment and other methodologies to assess transportation needs, analysis of the allocation formulas and potential proxies for transportation needs, and analysis of financial data and revenue projections.

Structured Interviews

Throughout the study, JLARC staff conducted numerous interviews with VDOT staff, including staff from transportation planning, traffic engineering, structure and bridge, financial planning, urban and secondary roads, data management, programming and scheduling, the Virginia Transportation

Research Council, and executive management. JLARC staff also interviewed the Secretary of Transportation and VDOT's assistant commissioners for finance and for the environment, transportation planning, and regulatory affairs. JLARC staff also interviewed FHWA staff about the Highway Economic Requirements System and the federal bridge program.

JLARC staff met with a variety of local transportation officials to obtain their perspective on the strengths and weakness of the current funding system as well. JLARC staff also interviewed a number of representatives from the transit industry, including the Director of DRPT and staff of that agency, directors of various transit properties across the state, and the Virginia Transit Association.

Panels and Request for Comments

To receive the local government perspective, staff convened two panels of local governments to solicit input. These panels were arranged by the Virginia Municipal League and the Virginia Association of Counties, and were attended by local elected officials and county and city staff. Because not all localities were able to attend the panels, JLARC staff also sent letters to each locality in Virginia soliciting their input on transportation funding issues. Finally, JLARC staff also held a third input session for members of the Commonwealth Transportation Board.

Analysis of Highway Needs Assessment Methodologies

JLARC staff undertook an extensive assessment of VDOT's 2001 quinquennial needs assessment to determine whether it could be used as the basis for testing potential allocation formulas. JLARC staff reviewed other states'

uses of needs assessments, and evaluated alternative tools that could be used to objectively assess needs. As part of this analysis, JLARC staff reviewed the types of data that are currently collected on an ongoing basis, and the format in which they are stored, and what other factors would assist in developing an objective portrayal of transportation deficiencies.

Analysis of Highway Economic Requirements System (HERS)

As an alternative to the VDOT 2001 needs assessment, JLARC staff reviewed the Highway Economic Requirements System (HERS) model, which is a needs analysis tool developed and used by the Federal Highway Administration (FHWA) for purposes of determining highway investment requirements. HERS uses objective criteria, such as traffic volume, projected traffic growth, pavement condition, and roadway geometrics, to determine highway deficiencies and select corrective measures. JLARC staff conducted a comprehensive review of the model and the assumptions on which it is based to determine whether it could be used effectively to develop a needs assessment. JLARC staff then applied the model to develop an assessment of State highway needs.

Analysis of Potential Proxies for Transportation Needs

In order to develop formulas that would reflect the relative distribution of transportation need across the State and among the highway systems, JLARC staff collected data representing dozens of demographic, economic and transportation measures from a number of sources, including VDOT and the Weldon Cooper Center for Public Service. JLARC staff conducted analyses to

test these measures for their relationship with the distribution of highway needs of each of the roadway systems. This analysis was used to determine which local and regional characteristics had the strongest relationships to highway construction needs. The factors found to be the best predictors of identified needs then were used to develop allocation formulas for each of the funding categories. JLARC staff also evaluated potential data sources in terms of ease of collection, availability, and reliability.

Analysis of Financial Data and Revenue Projections

JLARC staff reviewed VDOT's six-year allocation spreadsheets, which serve as the basis for the Virginia Transportation Development Plan (VTDP) and the assumptions underlying it. Staff also reviewed historical trends in spending for maintenance and operations to project future growth in these areas. Finally, JLARC staff reviewed revenue forecasts produced by the Department of Motor Vehicles (DMV) and VDOT. The purpose of these reviews was to assess the overall level of funding anticipated to be available for construction purposes over the next ten to 20 years.

Other States Review

JLARC staff conducted a review of other states to assess how they allocate highway construction funds. This review included an examination of other state statutes. In addition, interviews were conducted with state transportation officials in selected states.

REPORT ORGANIZATION

This report is organized into five chapters. Chapter I has provided an overview of transportation finance in Virginia, prior studies on the distribution of highway funding, and the JLARC review. Chapter II discusses the needs assessment process and how it has been used to establish equitable formulas to distribute construction funds. The chapter also discusses a proposed new classification of road systems and the establishment of new funding regions. Chapter III presents an analysis of the allocation of funds among and within roadway systems and presents recommended allocation formulas. This chapter also discusses the implications of the proposed formula changes and the establishment of a separate bridge fund. Chapter IV examines the adequacy of available transportation funding and the impact of the Virginia Transportation Act on the selection of construction priorities. Finally, Chapter V discusses the role of transit in meeting Virginia's transportation needs.

II. Functional Classification System and Needs Assessment

The current system for allocating construction funding is outdated and needs to be revised to ensure that construction funds are equitably and efficiently allocated and distributed. The existing administrative system needs to be replaced with a road classification system based on the functional purpose of the roads, and the existing VDOT construction districts need to be replaced with new funding regions for purposes of allocating regional construction funds. The proposed system will promote flexibility in allocating construction funds and will not require significant changes to VDOT's organizational structure or the administration of its programs.

Because the proposed allocation system will continue to be needs based, VDOT should continue to conduct a needs assessment periodically. VDOT should make the needs assessment a higher priority and use available technology to improve the needs assessment process to produce one that is accurate and objective.

NEW CLASSIFICATION SYSTEM SHOULD SERVE AS BASIS FOR ALLOCATION OF HIGHWAY CONSTRUCTION FUNDS

The existing system for the allocation of highway construction funds is based on an antiquated and somewhat arbitrary road classification system that is not related directly to the functional purpose of roads, and which does not reflect major changes in the federal funding structure that have occurred over the last several years. As a result, the current allocation system is inefficient and does

not ensure that construction funds are allocated based on relative need among the State's road systems.

The current system needs to be replaced by a system that classifies roads based on their functional purpose. The proposed classification system should be a three-tier system with statewide, regional, and local roads. A functionally based classification system would better ensure that road construction funds are efficiently and equitably allocated to fund State road priorities and address the greatest and most significant road needs.

All Roads Are Classified by Functional Class

Two nationwide studies conducted between 1969 and 1971 called for the classification of existing highways by their functional purpose based on the recognition that each road serves a specific function. Congress subsequently enacted the Federal-Aid Highway Act of 1973, which required roads that are part of the federal highway system to be classified by function. As a result of this continuing federal requirement, VDOT classifies all Virginia roads by federal functional class (purpose). This classification, which is partially dependent on census data, is updated after each ten-year census.

Functional Classification System. The functional classification system divides roads into two systems: urban and rural functional systems. This distinction between urban and rural networks is based on the assumption that urban and rural areas have fundamentally different characteristics as to density and land use, density of street and highway networks, nature of travel patterns, and the way in which all of these elements are related. A road's classification as

urban or rural depends on whether the road is located in an area designated by the census as an urbanized area or other area with a population having 5,000 or more. Roads in these areas are part of the urban system. The remainder of roads comprise the rural functional system.

Within the urban and rural systems, roads are further classified in four major categories: (1) principal arterials; (2) minor arterials; (3) collectors; or (4) locals. The rural system further subdivides collectors into major and minor collectors. Rural minor collectors as well as urban and rural local roads are classified but are not part of the federal highway system.

These four major classifications of roads are based on functional purpose. The principal arterial system generally serves statewide and interstate travel. Within urban areas, the principal arterials also serve to support major traffic movements within the region. Interstate highways are a subcategory of the principal arterial system.

The minor arterial system generally serves regional traffic and supplements the principal arterial system. Rural minor arterials link cities, larger towns, and other traffic generators such as major resorts. Urban minor arterials are roads that augment and interconnect with the principal arterials and provide service for trips of moderate length within an urban area.

Collectors are local in their purpose. Rural collector routes generally serve travel within counties. Urban collectors provide both land access service and traffic circulation within residential neighborhoods. Finally, both urban and rural local roads primarily provide access to adjacent land. Figure 5 shows the

federal classification system. Exhibit 2 provides a description of each category of road within the federal classification system.

Size of Functional Classes. The rural functional system, with 104,740 lane miles, is more than double the size of the urban system, which has 44,180 lane miles. The size of the functional classes varies substantially. The rural local class is the largest functional class with 63,687 lane miles. Conversely, the smallest functional class is the urban collector class with only 4,067 lane miles. The rural principal arterial class includes 8,814 lane miles, and the urban principal arterial class contains 7,128 miles. Table 1 shows the number of lane miles by functional class.

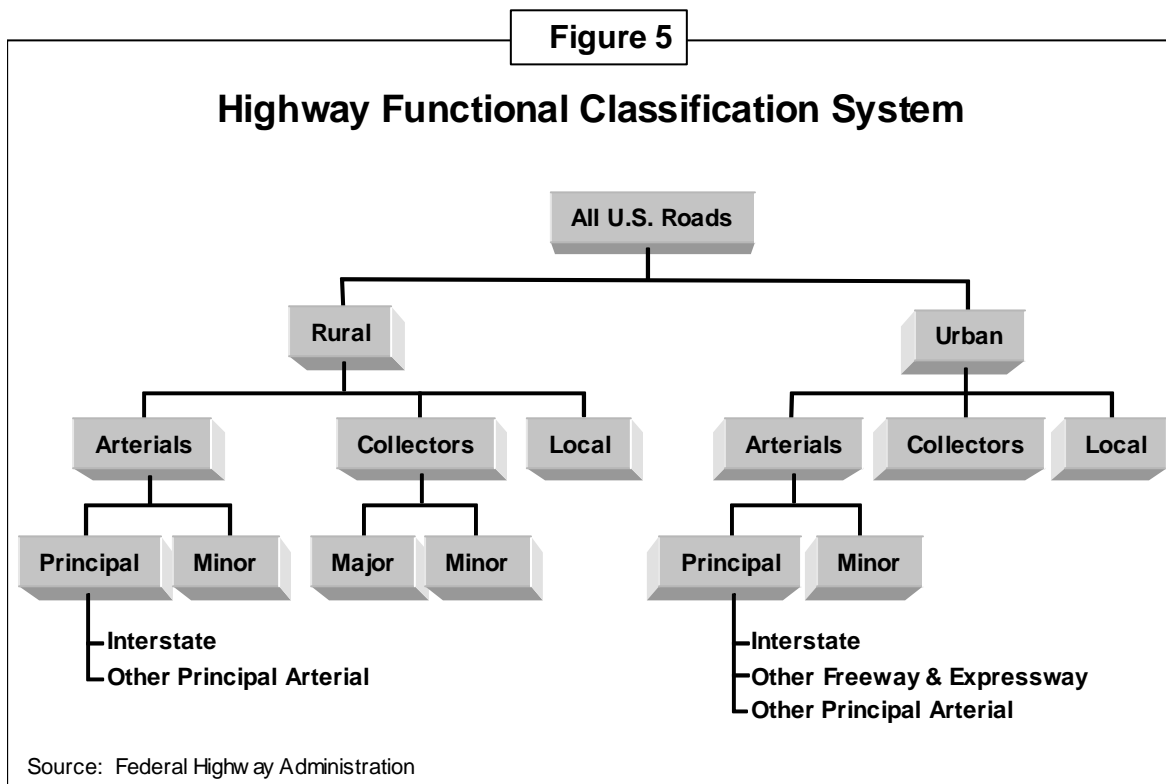


Exhibit 2	
Federal Functional Classification System	
<u>Road System</u>	<u>Description</u>
Rural	
Principal Arterials	Serve corridor movements having trip length and travel density characteristics indicative of substantial statewide and interstate travel (includes interstate roads).
Minor Arterials	Link cities, larger towns, and other traffic generators providing an integrated network for interstate and inter-county service.
Major and Minor Collectors	Serve travel of primarily intra-county rather than statewide nature and constitute those routes on which predominant travel distances are shorter than on arterial routes.
Locals	Provide access to adjacent land.
Urban	
Principal Arterials	Serve the rural principal arterial traffic traveling through areas and the major traffic movements within urban areas.
Minor Arterials	Serve to interconnect and augment the principal arterial system and provide for trips of moderate length within urban areas.
Collectors	Provide both land access service and traffic circulation within residential neighborhoods and commercial and industrial areas.
Locals	Provide access to adjacent land.
Source: Federal Highway Administration publication entitled "Highway Functional Classification – Concepts, Criteria, and Procedures".	

National Highway System. In 1995 Congress supplemented the functional classification system with the creation of the National Highway System (NHS). The NHS system is comprised almost entirely of principal arterial

Table 1 Lane Miles by Functional Class			
<u>Functional Class</u>	<u>Rural</u>	<u>Urban</u>	<u>Total</u>
Principal Arterial	8,814	7,128	15,942
Minor Arterial	7,503	5,714	13,217
Collector	24,736	4,067	28,803
Local	63,687	27,272	90,958
Total	104,740	44,180	148,920
Source: VDOT data. Totals vary due to rounding.			

roadways designated by Congress as significant components of the national highway network. Federal law states:

The purpose of the National Highway System is to provide an interconnected system of principal arterial routes which will serve the major population centers, international border crossings, ports, airports, public transportation facilities, and other intermodal facilities and other major transportation destinations; meet national defense requirements; and serve interstate and interregional travel.

In Virginia, the NHS system, which has 14,194 lane miles, includes all of the interstate miles as well as 77 percent of the other principal arterial miles. Figure 6 is a map of the NHS system. Appendix A of this report lists each of the routes that are part of the NHS system.

Existing Administrative System Is Antiquated and Not Based on Functional Purpose

The current administrative system, which has evolved over 80 years, is

Figure 6

National Highway System



Source: VDOT data.

Note: See Appendix A for a listing of system road segments in urbanized areas.

not based on the functional classification system developed by the Federal Highway Administration. As a result, each road system within the existing administrative classification system contains a collection of roads with multiple functional purposes.

Development of the Administrative System. The Virginia General Assembly established the State highway system in 1918. The system initially was a network of 4,000 roads linking cities in the State. In 1932, the General Assembly passed the Byrd Act that established a unified State secondary system, which included all of the county roads with the exception of the roads in four counties. The 1932 Byrd Act also established the authority for the State to help fund the construction of roads in cities and towns. The *Code*, however, does not contain any provision expressly establishing the urban system of roads. In 1938, the General Assembly designated the State highway system as the “primary system.”

Administrative System Classification Is Substantially Different than Functional Classification System. The evolution of the current administrative system in Virginia has resulted in both primary and urban systems with a substantial amount of roads in multiple functional classification categories. The primary system includes a large number of lane miles in three different functional categories: 38 percent of primary lane miles are principal arterials, 36 percent are minor arterials, and 24 percent are collectors. Only two percent of primary roads are classified as local roads. The primary system contains 5,621 lane miles of collector or local roads.

Similarly, the existing urban system contains a substantial number of lane miles in four different functional classifications: 10 percent of urban lane miles are principal arterials, 15 percent are minor arterials, nine percent are collectors, and 65 percent are local roads. Excluding the functionally classified local streets, the remaining roads are fairly evenly distributed among the principal arterial, minor arterial, and collector categories.

The secondary classification most closely matches the functional classification system. Most of the roads in the secondary system are functionally classified as collector or local roads. However, there are 2,100 lane miles of roadway in the secondary system classified as arterials. Table 2 shows a breakdown of functional miles within each administrative class.

There are numerous examples of roads that serve a regional purpose and carry high volumes of traffic but are classified currently as secondary roads. Braddock and Franconia roads in Fairfax county are both roads that are part of the secondary system but are functionally classified as urban minor arterials and carry more than 40,000 vehicles a day. One section of Braddock road carries 77,000 vehicles per day. In Henrico county, Parham road is a secondary road (for construction purposes) that is functionally classified as an urban principal arterial, is part of the National Highway System, and carries more than 55,000 cars per day on some sections.

Conversely, there are numerous examples of roads in the primary system that are functionally classified as collectors and carry only small volumes of traffic. Examples include Route 52 in Bland county and Route 84 in Highland

Table 2 Administrative System Lane Miles by Functional Class						
Functional Class	Primary System		Urban System		Secondary System	
	Miles by Functional Class	% of Total Primary Miles	Miles by Functional Class	% of Total Urban Miles	Miles by Functional Class	% of Total Secondary Miles
Principal Arterial	8,186	38	2,226	10	196	<1
Minor Arterial	7,805	36	3,508	15	1,904	2
Collector	5,163	24	2,153	9	21,487	22
Local	458	2	14,818	65	75,682	76
Total	21,612	100	22,705	100	99,269	100
Note: Urban and rural networks have been combined for purposes of this analysis. Percentages do not total 100 due to rounding. Source: JLARC analysis of VDOT data.						

County, which are both classified as collectors and carry only 200 vehicles per day on some sections.

Limitations of Using Administrative Classification to Distribute Construction Funds

Using the existing administrative classification system to distribute highway construction funds has several limitations. No funds are allocated expressly for a system of roads of statewide significance. Instead, funds are allocated to the primary system. While the primary system includes many of the roads of statewide significance, it does not include the interstate roads, and it includes many other roads that have only a regional or local function. The

General Assembly recognized the shortcomings of the primary system in 1964 when it established the State “arterial highway network.” The arterial network was created to form a State network of roads and to distinguish those roads in the primary system that were of statewide significance from roads in the system with a lower priority. Originally, there were separate funding mechanisms for roads that were part of this designated network. However, in recent years, there has been no distinction made between roads that are part of the arterial network and other primary roads.

Another limitation of the current classification system is that roads with different functional purposes have to compete for the same allocation of highway construction funds. Within each of the administrative systems, local road projects have to compete with projects on roads of regional or statewide significance for the same allocation. Within both the primary and urban systems, proposed projects on collector roads have to compete for funding with proposed projects on principal arterials.

Both VDOT officials and CTB members assert that the smaller primary projects are often underfunded because they must compete with major primary projects for the same allocation. According to one VDOT official, these projects “often get lost in the shuffle.” A CTB member expressed the same concern. He stated that a major principal arterial project “has drained funds from all of the other needed projects in the district.” While this would continue to be a problem to some extent even under a functional classification system, because the scale of projects would still vary, classification of roads by functional class would

reduce the variation in projects competing for the same allocation. For example, improvements to a section of a collector road would no longer have to compete with principal arterial projects for funding.

A further limitation of the existing funding structure is that funding decisions regarding roads are often not being made by the appropriate decision-maker. Funding decisions regarding some roads of statewide or regional significance are being made by local boards of supervisors. For example, local boards are making funding decisions regarding heavily traveled arterial roadways like Barracks Road in Albemarle County that carries 21,000 vehicles per day and Prince William Parkway in Prince William county that carries 49,000 vehicles per day. Conversely, the CTB is making decisions about construction projects on roads in the primary system that serve local transportation purposes such as Route 300 in Powhatan county, which is functionally classified as a collector and carries less than 400 vehicles per day on some sections.

New Three-Tier Road System Should Be Developed Based on Functional Class

Based on the shortcomings of the present administrative classification system and the potential advantages of modifying it, the current system needs to be replaced with a three-tier system based on functional classification and roadway significance. The first tier should be the highest level roads which are roads of statewide significance. The NHS system can serve as the basis for determining which roads are part of this statewide system. These roads, which Virginia identified as its critical inter- and intrastate corridors, appear to be the same roads that should comprise the State's highway network. As mentioned

previously, the NHS system is a functionally based system and is primarily comprised of the interstate roads and other principal arterial roadways in the State.

The second major classification should be a regional system that includes all of the roads in the State that serve a regional functional purpose. The functional system provides a useful tool for determining which roads are of regional significance. Generally, roads that are classified as minor arterials are considered to serve a regional function. By definition, these are roads that connect cities and towns in the rural areas and augment the principal arterial system within urban areas. The regional system also should include any principal arterials not classified as part of the statewide system. Most such principal arterials are in urban areas.

The remaining roads should be classified as local roads. This third classification would include all roads that are functionally classified as either collectors or local roads. Roads in these two categories serve local purposes. Table 3 shows lane miles in Virginia by the administrative and proposed new classification systems.

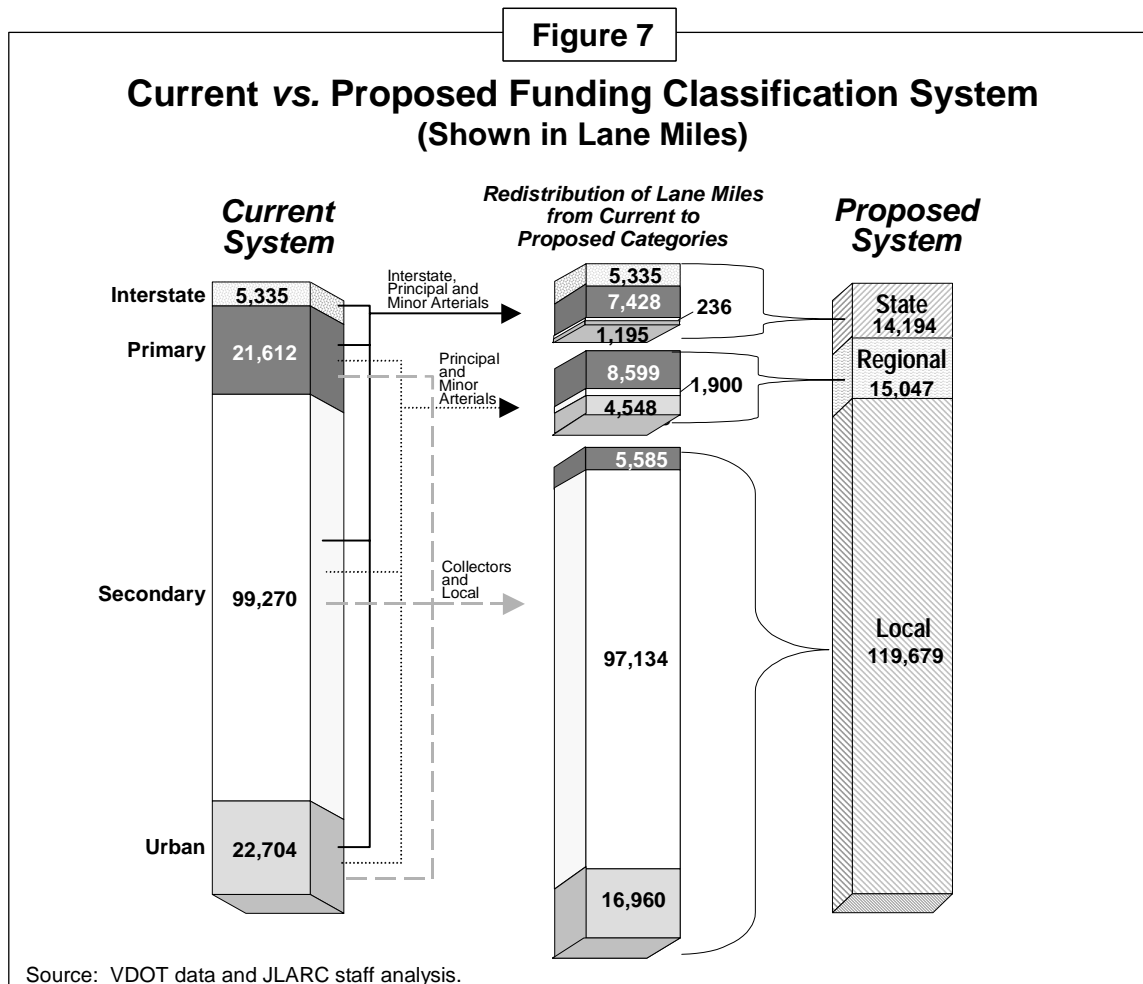
With the proposed classification system, the regional category would include less mileage than the current primary system. More than 7,400 lane miles of roads formerly in the primary system would become part of the statewide System, and about 5,600 miles would become part of the local system. This movement of miles to the statewide and local systems would be partially offset by

Table 3 State Lane Miles by Administrative and Proposed Classification Systems			
Administrative System		Proposed System	
System	Lane Miles	System	Lane Miles
Interstate	5,335	Statewide	14,194
Primary	21,612	Regional	15,047
Secondary	99,270	Local	119,679
Urban	22,704		
Total	148,920		148,920
Note: Secondary lane miles includes Arlington and Henrico county roads. Component lane miles do not add to total due to rounding. Source: JLARC analysis of VDOT data.			

the classification of minor arterials in the urban and secondary systems as regional roads. About 4,500 miles in the current urban system would become part of the regional system, and about 2,000 miles of secondary roads would become regional roads. The total number of miles in the local system would be approximately the same number as was in the urban and secondary systems combined. Table 4 provides the lane mileage from each administrative system as well as the interstate system in the proposed statewide, regional, and local systems. Figure 7 shows a comparison of the current and proposed systems and shows how the existing system lane miles are distributed under the proposed system.

Table 4 Lane Mileage from Each Administrative Road System in Proposed Statewide, Regional, and Local Systems				
Proposed Road Classification	Interstate Lane Miles	Primary Lane Miles	Secondary Lane Miles	Urban Lane Miles
Statewide System	5,335	7,428	236	1,195
Regional System		8,599	1,900	4,548
Local System		5,585	97,134	16,960

Note: Table includes Arlington and Henrico county roads.
Source: JLARC analysis of VDOT data.



Proposed New Classification System Would Improve Allocation System

The proposed classification system could address some of the limitations of the current system as well as improve the allocation process. It would increase focus on the State network of roads and help to ensure that it is adequately funded. In addition, a separate system for regional roads would help to ensure that regional and local roads are funded in proportion to their needs. The proposed system would also help to ensure that like projects are competing for construction allocations, and funding decisions are being made by the appropriate decision-makers.

VDOT and CTB Need to Consider and Focus on the Statewide System Separately. Ensuring that the State network of priority roads is adequately funded to meet statewide travel needs should be a high priority of the allocation system. By developing the State network as a separate funding classification, the CTB and VDOT can focus more effectively on the statewide system and ensure that it receives adequate funding relative to the other systems.

Interstate System Needs to Be Integrated into the Statewide System with Changes in Federal Law. Developing a classification for roads of statewide significance is consistent with the federal law changes. With the completion of construction of the interstate system, it is no longer considered a separate program and is now part of the NHS system. As a result, Virginia no longer receives federal construction funding for the interstate system separately, but instead receives funding that can be used for interstate or other NHS system projects. The previous basis for distinguishing between the interstate system

and other priority principal arterials no longer exists, and they should be considered together as part of the State network for purposes of allocating construction funding.

Regional and Local Roads Need to Be Considered Separately for Allocation Purposes. In addition to designating a statewide system, the remaining roads should be classified by functional purpose into two categories -- regional and local -- and the allocations to these roads should be based on such classifications. With roads classified by functional purpose, the proportional need on those roads and the appropriate amount of funds allocated to these road systems can be determined more easily. Moreover, allocating funds by functional purpose instead of by a more arbitrary classification system ensures that regional projects are competing with other regional projects for funding, and local road projects are not required to compete with regional or statewide projects for construction dollars.

Decision-Making Authority Should Be Based on Functional Purpose. The proposed classification system is also needed to ensure that the appropriate decision-making authority is making the funding decisions about the appropriate roads. This should be based on the functional purpose of the road. Funding decisions regarding statewide projects should be made by the Commonwealth Transportation Board. Decisions about regional road projects should be made by the CTB in coordination with local governments, and where appropriate, regional bodies within the region impacted. Finally, funding decisions regarding roads that are local in purpose should be made by local governing bodies. Establishing

a funding system based on the functional purpose of roads enables the development of a system in which the appropriate governing body is making the funding decisions within the various road systems.

Recommendation (1). The General Assembly may wish to consider amending Articles 1.1 and 2 of Title 33.1 of the *Code of Virginia* to repeal the current administrative classification system and establish a new three-tier system for the allocation of highway construction funds that consists of statewide, regional, and local systems based on the federal road classification system.

Recommendation (2). The General Assembly may wish to consider amending Articles 1.1 and 2 of Title 33.1 of the *Code of Virginia* to specify that the Commonwealth Transportation Board shall have the authority to allocate statewide system funds at the project level based on system priorities, and the authority to allocate regional system funds at the project level in coordination with local governments, and where appropriate, regional bodies within the region impacted. The General Assembly may wish to further specify that local governments shall have the authority to allocate all local system funds based on local priorities.

New Funding Regions Should Be Established to Replace Existing VDOT Districts for Purposes of Distributing Regional Construction Funds

Along with the classification of roads based on functional purpose, new funding regions are needed for purposes of distributing regional construction funds. The current districts are not clearly related to major transportation corridors. New funding regions need to be developed to reflect regional structures and transportation corridors.

Existing VDOT Districts are Antiquated and Arbitrary. With the exception of the Northern Virginia district, the existing VDOT districts, which are presently used as the regions for distributing primary funds, are based on Congressional district boundaries established in 1922. With one exception, these 80-year-old districts bear no relation to transportation corridors or regional transportation entities such as metropolitan planning organizations (MPOs) or

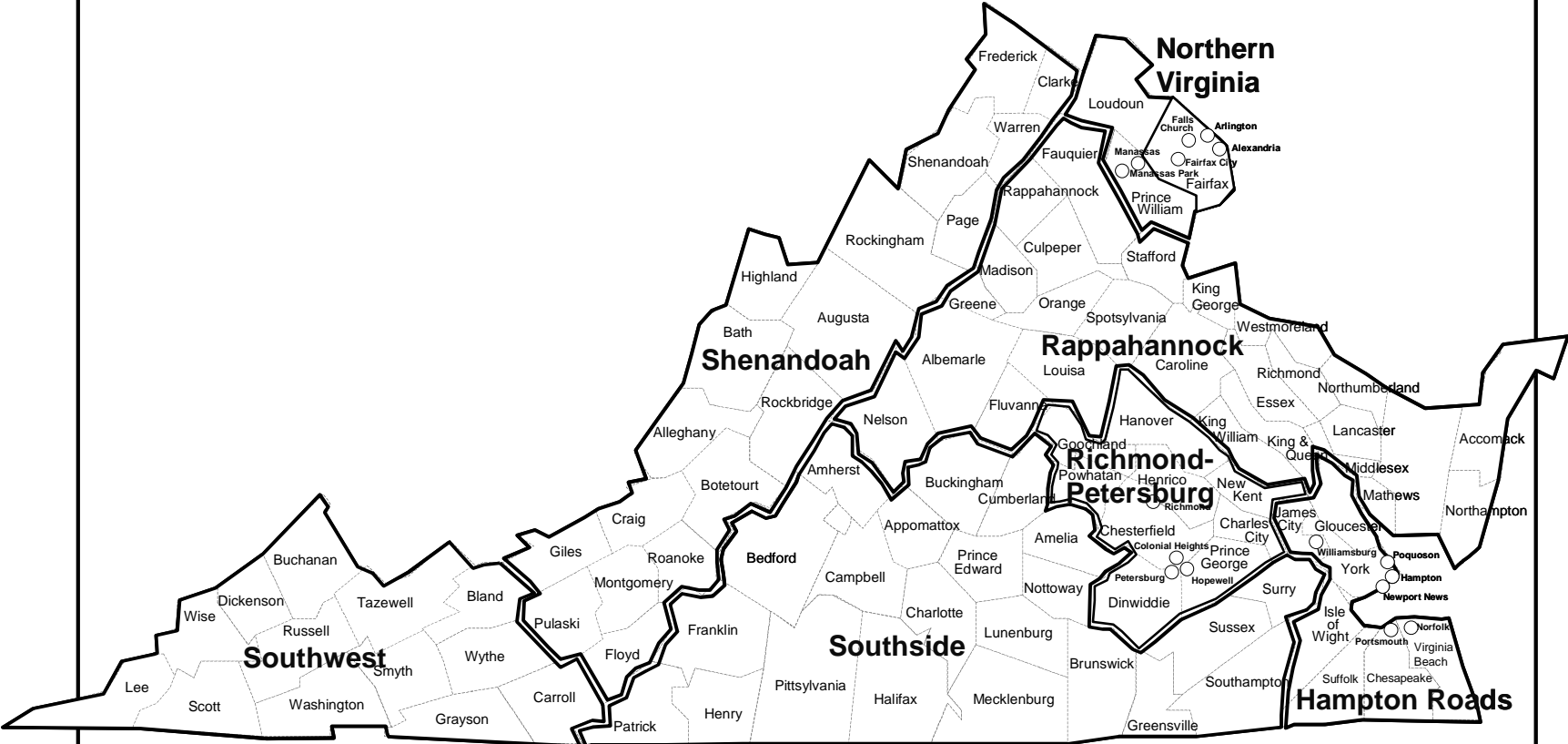
planning district commissions. The only district based on regional transportation boundaries is the Northern Virginia district, which was created in 1984 and has the same boundary as the Northern Virginia MPO.

Seven Funding Regions Should Be Created. Seven new funding regions are proposed to replace the existing districts for the purpose of allocating regional highway construction funds (Figure 8). The proposed Northern Virginia and Hampton Roads regions would reflect the MPO boundaries in those two regions. The Richmond area funding region would include the localities that are presently in the Richmond and Tri-cities MPOs. A fourth Southside region contains most of the major southern transportation corridors including Routes 60, 360, 460 and 58. The Shenandoah region would include most of the Interstate 81 corridor. The proposed Southwest region would include the remainder of the Interstate 81 corridor as well as the Interstate 77 corridor. Finally, the Rappahannock region would include the Route 17 corridor and most of the Route 29 and Route 3 corridors. The Eastern Shore is included within this region, but it does not have any regional system roads.

Regions Would Help to Promote Regional Participation in Funding Decisions Regarding Regional Roads. The primary basis for developing the new funding regions would be to further promote and facilitate a regional approach to transportation planning and funding. Given this purpose, the first priority in developing the new regions was to create regions that reflected the existing MPO boundaries in the three major urban areas. As mentioned previously, the only VDOT district that currently has the same boundary as the

Figure 8

Proposed Funding Regions



Source: JLARC staff analysis.

MPO is the Northern Virginia district. Neither the Hampton Roads nor the Richmond districts have the same boundaries as the MPOs in those regions. Under federal law, regional transportation planning is required through the MPO process. The MPO process is based on the concept that transportation planning in urbanized areas needs to be regional in nature. Based on federal requirements, each of the urban areas of the State has an MPO with responsibility for conducting regional transportation planning and developing both a 20-year transportation plan and a three-year transportation improvement program. Given the importance of a regional approach to the development of transportation solutions in highly urbanized areas and the existing MPO structure, developing funding regions based on these MPO boundaries should facilitate the planning and funding processes on a regional basis. These MPOs can coordinate with the CTB regarding construction priorities within each of the three major urban areas based on the allocation of regional funds to each of these funding regions.

The other four proposed regions do not have a regional structure that represents the regions as a whole like the three urban regions. However, with the remaining regions based on transportation corridors and the allocation of funds specifically for regional roads, there will be more incentive for localities within regions to work together and with the CTB to ensure that funds are efficiently and equitably allocated to regional transportation priorities. Planning districts and MPOs within the region could play a role in developing a regional structure. In contrast to the existing VDOT administrative districts, which cut

across PDC boundaries, the boundaries of the proposed funding regions mostly coincide with existing PDC boundaries.

These funding regions could also be updated over time. As MPO boundaries in the major urban areas change, the funding regions could be modified to reflect the new boundaries.

The maps on the following two pages show the extent to which the proposed funding regions coincide with major transportation corridors, and the extent to which the existing VDOT districts do not. Two examples that demonstrate this are Route 58 and Interstate 81. The NHS portion of Route 58 is currently in four different VDOT districts but would be in only two of the proposed funding regions. Also, Interstate 81 currently extends across three VDOT districts but would only be in two of the proposed funding regions. Figure 9 shows the proposed statewide road system and the proposed funding regions. Figure 10 shows the proposed statewide system and the existing VDOT districts.

***Recommendation (3).* The General Assembly may wish to consider establishing seven funding regions based on metropolitan planning organizations and major transportation corridors and require that regional system construction funds be allocated among the regions instead of among the existing Virginia Department of Transportation districts.**

**CTB Members Should Be Appointed from Funding Regions
Instead of from VDOT Districts**

With new funding regions, the composition of the CTB would need to be modified to reflect this change. Currently, nine of the 17 CTB members are appointed from each of the nine construction districts. If new funding regions are established, CTB members should be appointed from each of the new funding

Figure 9

Proposed Statewide Highway System Shown in JLARC Staff-Proposed Funding Regions

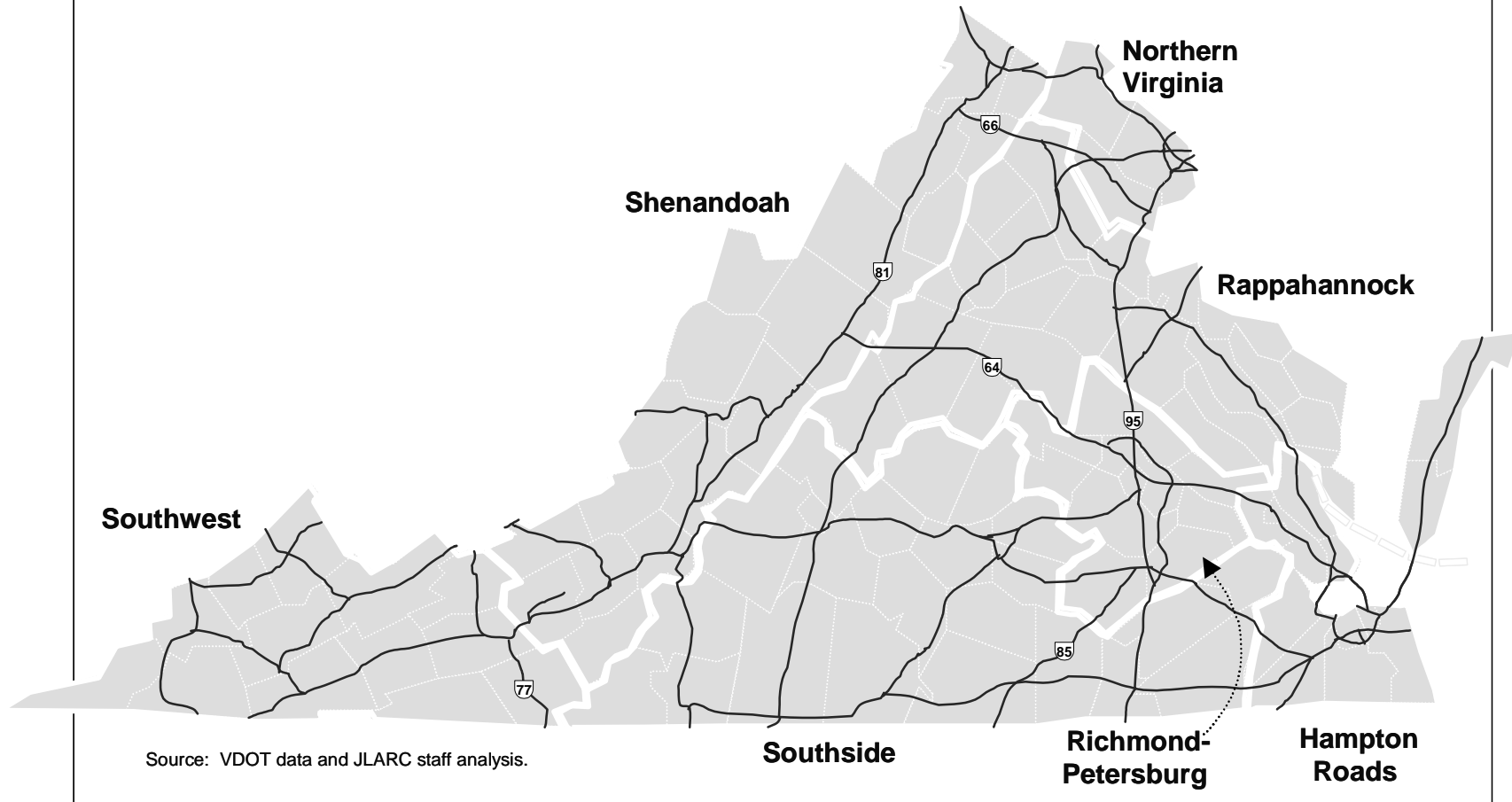
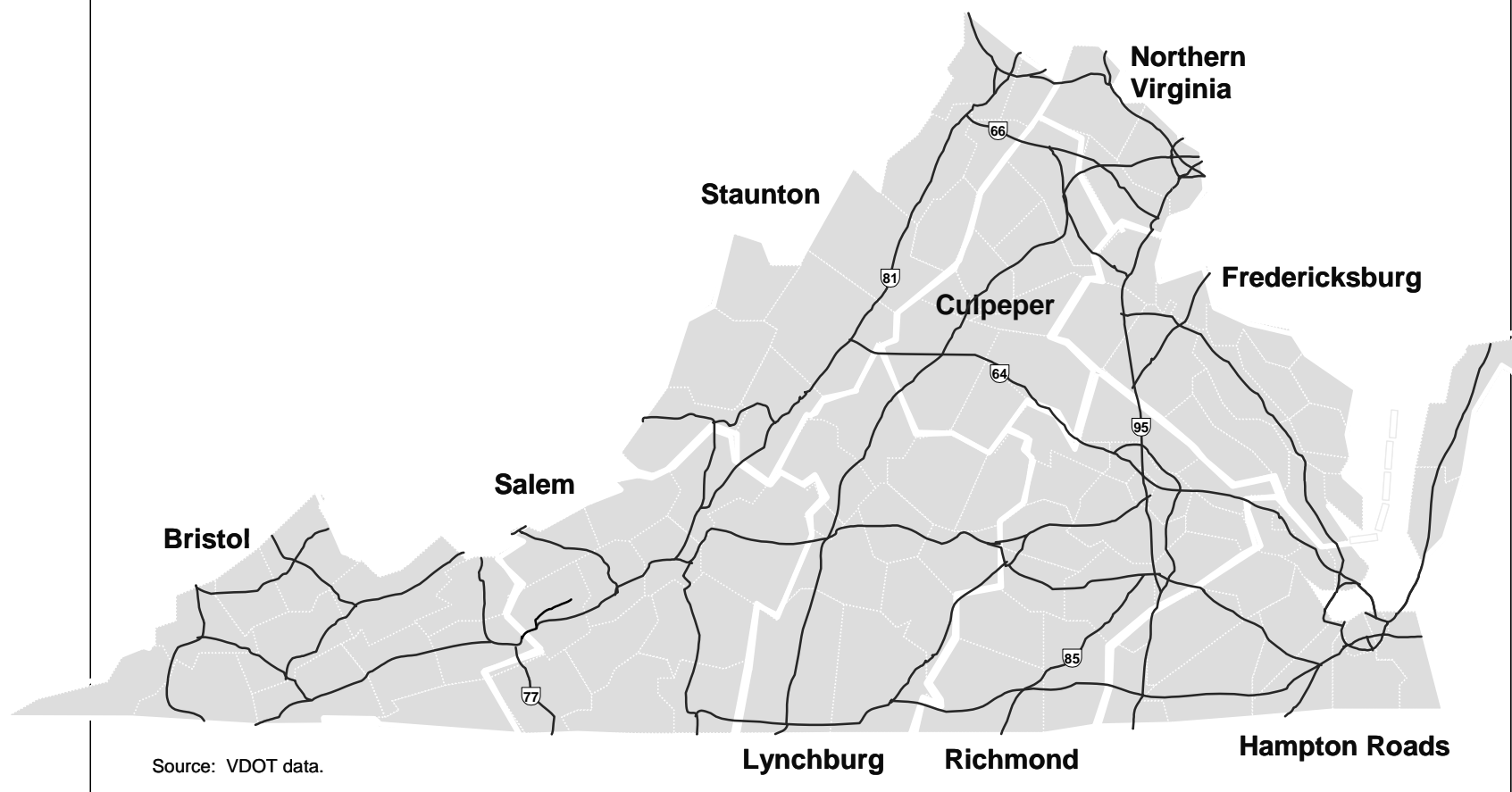


Figure 10

Proposed Statewide Highway System Shown in Current VDOT Districts



regions instead of from the existing VDOT districts. As a result, the number of members of the Board appointed to represent the regions of the State could be reduced from nine to seven, which would reduce the overall membership on the Board by two.

To ensure consultation between regions and the CTB regarding regional road funding, the CTB should schedule regular meetings with local government officials, MPOs, and other interested regional entities such as planning district commissions. The purpose of these meetings would be to establish a mechanism for localities, MPOs, and other regional entities to provide input regarding funding allocations within the regional system.

***Recommendation (4).* The General Assembly may wish to consider amending § 33.1-2 of the *Code of Virginia* to repeal the requirement that there be one Commonwealth Transportation Board member appointed from each of the nine construction districts and to instead require that one member be appointed from each of the seven new funding regions.**

System Should Provide Flexibility

While construction funds should be allocated proportionally among the systems based on need, the system should be flexible enough to allow funds to shift among systems as needed. For example, there may be situations in which local or regional priorities or needs may differ to some extent from the distribution or allocation of funds. In such circumstances, there should be flexibility to transfer funds among systems or to combine funds from more than one system allocation to fund a project. For example, if the CTB has determined that a project on the statewide system is not a sufficiently high priority on which to use statewide funds, the CTB should have the flexibility to use regional funds for such

a project if local governments within the region desire to use their regional funds for the project. Similarly, if the CTB has sufficient funding to finance only a portion of a statewide system project in a region, then the CTB should have the flexibility to supplement statewide system funds with regional funds if the project is a high priority for the region.

This same flexibility should apply to regional and local funds. If a regional system project is a high priority for a locality but has not been funded or has been only partially funded by the CTB with regional funds, then a locality should have the flexibility to fund the project or supplement regional funds that have been allocated with local funds.

In addition to the flexibility to move money among systems, local governments should have the flexibility to spend local system funds on any local roads. Historically, VDOT has excluded functionally classified urban local streets in cities and towns from those functional categories of urban roads eligible to receive urban system construction funds. There is no similar restriction on urban counties, which also have streets that are functionally classified as urban local streets. This distinction between cities and counties does not appear to have any basis. If cities and towns desire to allocate construction funds to local streets then they, like counties, should have the flexibility to do so.

Along with flexibility within the highway system, the flexibility that currently exists to move funds between highway and transit projects should continue. If the CTB determines that State or regional transit projects are a high priority for addressing travel demand in a congested corridor, then the CTB

should have the flexibility to spend funds on transit projects in addition to or instead of a road project. Likewise, if a local government determines that a transit project is a higher priority than a new road project, the local government should have the flexibility to spend allocated local funds on transit.

Recommendation (5). The Commonwealth Transportation Board should rescind the provisions of the 1987 Board resolution that limits expenditures of urban funds by cities and towns to arterial and collector roads and adopt a resolution that gives cities and towns the authority to spend local system funds on any local streets and collectors.

Maintenance and Administrative Systems Should Be Revised Over Time, but City Street Payment System Does Not Require Modification

Adoption of the proposed funding regions would not require that VDOT's administrative and maintenance functions be modified initially. The administration of the transportation functions could continue to be conducted using the existing district and residency structure even if the funds were allocated based on the proposed funding regions. However, over time VDOT should conform the administrative and maintenance functions to the new funding regions. Cost savings could be achieved by phasing out two of the nine district headquarters. In addition, the administration of VDOT and the work of the CTB would be simplified by having only one set of regions or districts for all purposes.

Responsibility for maintaining city streets would not need to be modified under the proposed changes to the allocation system. Cities would still maintain roads within their boundaries. The primary change for cities would be that construction funds for some road improvements on higher level roads within their jurisdictions would generally come from a regional allocation instead of a direct allocation to the jurisdiction. However, under both the proposed and

existing systems, construction funds would be provided by the State primarily. Therefore, the proposed new funding structure would not require changes to the existing city street payment system.

ACCURATE AND OBJECTIVE HIGHWAY NEEDS ASSESSMENT IS NEEDED

The current highway allocation formulas were established in 1985 based largely on the results of a statewide highway needs assessment. Since that time, the needs assessment process has undergone many changes and, in recent years, has become increasingly controversial, in part because of a misunderstanding about the reason the quinquennial needs assessment requirement was enacted. This section provides some historical background on the needs assessment requirement and its purpose, and explains why there is a continued need for a periodic, objective assessment of highway system needs.

Needs Assessment Process Was Developed to Determine Equitable Allocation of Funds

Virginia's comprehensive statewide highway needs assessment was first performed in 1982 for the last JLARC study of the allocation of highway construction funds. There were two primary uses of that needs assessment. First, the assessment was used to determine the distribution of needs among the State's three highway systems – primary, secondary and urban. Based on this analysis, JLARC recommended that funds be split among these systems in proportion to the relative share of needs. Second, the data also were used to test factors that could be used as proxies for need to distribute funds to the jurisdictions within each of these systems. As a result, JLARC recommended

formulas for the distribution of funds among the counties receiving secondary funds, among the jurisdictions receiving urban allocations, and among VDOT districts receiving primary system funding.

JLARC 1982-84 Study of Highway Allocation Formulas. In 1982, JLARC was directed to conduct a review of the “reasonableness, appropriateness, and equity of the statutory provisions for allocating highway construction funds.” In the course of conducting this multi-year study, JLARC staff defined equity as the allocation of highway construction funds according to relative highway construction needs. In order to develop allocation formulas that fulfilled this definition of equity, JLARC worked with VDOT to undertake what was the first comprehensive statewide assessment of highway needs.

JLARC staff used the results of the needs analysis to recommend the proportional distribution of funding among the three highway systems. But because highway needs could not be measured easily on an annual basis, and formulas could not be changed annually without disrupting long-term capital programming, JLARC staff did not recommend linking the allocation of highway construction funds within these systems directly with need. Instead, staff used the results of the needs assessment to find surrogates or proxies for need. JLARC used regression analysis to examine the relationship between need (as identified by the needs assessment) and factors such as population, vehicle miles traveled, and land area. This analysis was used to determine which local characteristics had the strongest relationships to highway construction needs.

The factors found to be the best predictors of identified needs then were used to develop allocation formulas for each of the road systems.

The 1984 JLARC study recommendations served as the basis for major changes to the allocation of highway construction funds that were enacted by the General Assembly in 1985. As part of the same legislative package, the General Assembly enacted a requirement that VDOT undertake a comprehensive assessment of construction needs every five years, beginning in 1989. This provision, §33.1-23:03 of the *Code of Virginia*, was intended to allow for future analysis of the equitable distribution of highway funding, and provide the data necessary to evaluate potential formula factors in the future. The allocation formulas have not been changed since 1985.

Determination of Proportional Distribution of Needs Among the Systems of Roadways. The first of JLARC's two uses of the 1982 needs assessment was an assessment of what proportion of funds should be distributed to each of VDOT's administrative highway systems. JLARC's 1984 recommendation that the funds be distributed one-third to the primary system, one-third to the secondary system, and one-third to the urban system was based directly on the distribution of needs identified by the needs assessment. Although the General Assembly did not enact this recommendation exactly, the agreed upon distribution – 40 percent to the primary system, and 30 percent each to the secondary and urban systems – was based on JLARC's recommendation. This proportional split has not been changed since 1985.

Absent a needs assessment, it would be difficult to justify revising the proportional split among the highway systems. Unlike distributions within the systems that arguably could be made based on demographic characteristics, there are no good measures other than need on which to base the distribution of funds among the types of roadways. A needs assessment provides the only mechanism to determine the appropriate split among the systems if equity continues to be defined as relative need.

Establishment of Equitable Distribution of Funds Among Localities/Districts. The second purpose for which JLARC staff used the needs assessment data in 1984 was to identify the factors that best reflected the differing levels of need among the jurisdictions within each system. JLARC staff used the needs assessment data to identify the independent variables that best mirrored the distribution of need among the localities and administrative districts that receive funding from the respective systems (for example, the proportion of secondary funds that goes to each county). As a result of this analysis, JLARC staff proposed alternative formulas for the distribution of primary, secondary, and urban system funding. The General Assembly adopted formulas proposed by JLARC staff for the secondary and urban systems and adopted a primary system formula that used factors and weights similar to those recommended by the JLARC report. These formula changes were enacted by the General Assembly in 1985. As with the split among the three systems, the formulas governing allocations within systems have not been adjusted since that time.

Assessment Subsequently Used to Evaluate Adequacy of Funding.

Just one year after the 1985 revisions to the highway allocation formulas, the General Assembly and the Governor created the Commission on Transportation in the 21st Century, or COT-21. Part of the Commission's charge was the confirmation of the critical highway and transportation needs of the Commonwealth. The Commission updated the needs assessment developed by JLARC and VDOT and used it as the basis of its analysis of the adequacy of available highway construction funds. As a result of its review, the Commission proposed (and the General Assembly later enacted) a series of measures that increased the revenue stream available to finance highway construction. More recently, the Commission on the Future of Transportation in Virginia, created by House Joint Resolution 160 of the 1996 General Assembly, utilized VDOT's 1994 needs assessment to evaluate the sufficiency of transportation funding. These secondary subsequent uses of the quinquennial needs assessment data to evaluate adequacy of funding have overshadowed the original purposes of the assessment, and have impacted how VDOT has conducted recent assessments.

Basis of Current Formulas and Purposes of Periodic Needs Assessments Appear to Be Misunderstood

In recent years, the requirement that VDOT conduct quinquennial highway needs assessments has become more controversial, in part because of a misunderstanding about why the quinquennial needs assessment requirement was enacted and how the results were intended to be used. As part of this study, JLARC staff held a series of meetings with State and local transportation officials, and requested written comments from all local governments in the State about

transportation funding and the needs assessment process. The responses received indicate that very few – even among Virginia’s transportation professionals – understand how the highway needs assessment was used to identify proxies for need and determine the equitable distribution of funds among the road systems.

When asked if Virginia should have a needs-based formula for the distribution of highway funding, most localities concurred. However, numerous localities then commented that the current formula factors bear no relationship to need. As one local official commented,

The existing process takes the total amount of available funds and redistributes them based on lane miles, population and types of roads. This does not reflect the use, condition or transportation needs of a particular locality or region. If the goal is to truly meet construction needs, and not just redistribute dollars, then another method is necessary.

Local officials appear not to realize the formula factors were originally selected because they best reflected the distribution of need.

Other localities view the primary purpose of the needs assessment as a tool to identify funding shortfalls. Although they acknowledge that needs assessments could be used to set distribution formulas, they felt this was secondary to the overall funding situation. One locality cited the results of VDOT’s most recent assessment as evidence that revenues for transportation are inadequate and commented, “it makes little sense therefore to argue about how to slice the pie until the total level of needed investment in the Commonwealth’s critical transportation infrastructure is aggressively addressed by State government.”

Similarly, the Secretary of Transportation and much of VDOT's leadership team appear to be unaware of the original purpose of the needs assessment the Department is required to conduct, and because of this, have been reluctant to fulfill the legislative requirement that the quinquennial needs assessment be developed and released. During interviews conducted as part of this study, VDOT staff at all levels repeatedly commented that the needs assessment "has no purpose," and "it isn't used for anything." Other staff commented that the needs assessment is, "nothing but a wish list used to support tax increases." Even at the highest levels, VDOT executives did not appear to know that the allocation formulas were developed to reflect the relative distribution of needs identified by the first statewide needs assessment.

VDOT is correct when it claims the needs assessment has been used to provide evidence of the need for additional funding for transportation. The technical report issued by the Commission on the Future of Transportation in 1997, which was based on VDOT's 1994 needs assessment, clearly focused on the adequacy of revenues, and did not address distributional issues. As previously noted, COT-21 also used a needs assessment to provide support for the creation of the Transportation Trust Fund and the revenues that support it. However, this does not negate the importance of an objective needs assessment for purposes of determining formula allocations. Because the goal behind the allocation formula is to link the allocation of highway funds to transportation needs, the assessment has to be updated periodically to ensure that the factors

used to distribute funds are still the best predictors of need, and that the proportional distribution among funds still mirrors relative need.

VDOT 2001 Highway Needs Assessment Is Inadequate

VDOT's most recent needs analysis is inadequate to fulfill the purposes for which the quinquennial needs assessment requirement was enacted. Under §33.1-23.03 of the *Code of Virginia*, VDOT must conduct a needs assessment every five years and present the results to the General Assembly and to local officials no later than October 1 of that year. Under the timelines established by this *Code of Virginia* section, VDOT was required to present a needs assessment by October 1, 1999. However, no needs assessment was released until January 2001, and then only following significant pressure from individual General Assembly members. When released, the needs assessment was submitted in the form of a letter, with no detailed analysis attached. VDOT provided the General Assembly only a summary of needs by system and region. Sufficient data against which to measure the continued appropriateness of the existing allocation formulas was not provided. In fact, VDOT did not really complete the assessment required by law.

Needs Assessment Was a Very Low Priority for VDOT. VDOT staff at all levels indicated the department did not commit substantial staff time or effort to the 2001 needs assessment for a number of reasons. First and foremost, executive management level support for the process was lacking. There was strong management opposition to producing a needs assessment, because it was believed that undertaking a needs assessment was a time consuming effort

resulting in a single number that then would be used to promote the need for increased revenues for transportation. Second, the effort was limited because staff were not given guidelines on what was to be included in (or excluded from) the needs assessment until shortly before the submission deadline. The late date at which the parameters of the assessment were provided to staff precluded substantial data collection and analysis. VDOT staff indicated that the preponderance of the work on the 2001 needs assessment was done by one person. In contrast, VDOT assigned 60 staff members to the needs assessment for over six months in 1994.

The low priority that VDOT's executive staff placed on the needs assessment is evident in the resulting product. Although VDOT never publicly released the volumes of data that made up the \$82 billion figure presented in the needs assessment letter of January 2001, the background data was made available to JLARC for this study. JLARC staff met with professional staff from VDOT's transportation planning division numerous times to verify the staff assessment of the data and methods used in VDOT's 2001 statewide needs assessment.

Needs Assessment Relied Upon Data that Had Not Been Updated.

The most obvious problem with VDOT's 2001 needs assessment is that in essence, VDOT did not undertake one. Instead, VDOT re-released the 1994 needs assessment with updated costs. VDOT's process for identifying needs has been to assess the deficiency of road segments, and then to determine the cost of the projects that would be required to improve the deficiencies. Yet for

the 2001 analysis, the deficiency data were not updated even though the data were more than seven years old. In lieu of collecting up-to-date data, or utilizing current data already in VDOT's possession, the department inflated the costs of each project identified in the 1994 assessment by a flat percentage rate statewide to reflect cost increases since that time. The only additions to the needs assessments were projects included in the Virginia Transportation Development Plan (VTDP) or the Virginia Transportation Act (VTA) that had not appeared in the 1994 needs assessment. Thus, road segments with deficiencies were included in the 2001 assessment only if they were in the 1994 assessment, and much of the data is at least seven years old. The only exception was the use of more up-to-date data on rural secondary roads, which were based on 1999 data.

The VDOT data could have been reanalyzed to produce a more current assessment of deficiencies had it not been for other age-related issues with specific data items used for the needs assessment. Because VDOT management placed such a low priority on the needs assessment, long-term data collection efforts were neglected. A few of the most critical data issues relating to the age of data are summarized below.

- In most cases, available and updated traffic data had not been added to the database since 1994.
- The traffic data were not from the same year for all segments. Thus, congestion deficiencies for one segment might be based on 1990 average daily traffic, and for another on 1994 traffic.
- No road segment had been evaluated for geometric deficiencies since the 1992-1993 time period.

Other Problems with VDOT Needs Assessment. JLARC staff found other problems in reviewing VDOT's 2001 needs assessment. Another concern is the widespread use of subjective decision-making to select or reject improvements identified through the deficiency analysis. Although specific engineering criteria were used to identify road segments that failed to meet engineering standards, VDOT staff reviewed the list of deficiencies and excluded thousands of segments based on professional judgment. An initial examination of the database uncovered more than 2,300 instances in which congestion deficiencies were identified, but no solution was proposed to address the deficiency. Conversely, many improvements were added to the needs assessment that did not address deficiencies based on engineering standards, because staff knew that projects were planned or under consideration on a particular route. Adding further subjectivity to the process was the fact that these inclusions and exclusions were done by different people for different regions of the State; thus there was no consistency even within the use of subjective professional judgment.

Another subjective aspect of the analysis was the assessment of geometric deficiencies. VDOT staff expressed concern to JLARC staff that the use of different staff across the State to evaluate geometric deficiencies resulted in inconsistent results. Staff felt the distinction between "poor" and "very poor" geometrics was not clear and had been inconsistently applied because these ratings are based only on visual inspection. VDOT staff indicated that this was a greater concern in 2001 compared to previous needs assessments because the

2001 assessment considered deficient only those road segments rated “very poor” in terms of geometric deficiencies, whereas both “poor” and “very poor” segments had been included in previous evaluations. Geometric deficiencies include sharp turns and steep grades.

One final concern about the methods used in the VDOT needs assessment is the project cost estimates applied to identified deficiencies. The cost factors used in the needs assessment database were based on the average cost of projects in the six-year plan during a three-year period in the early 1990s. Costs were inflated five percent per year to account for inflation since that time. Concerns relating to the cost estimate process are the following:

- Project costs for each type of roadway were developed based on small samples (most categories had fewer than ten projects) and have not been updated or verified since the early 1990s.
- The same construction costs were used statewide. For example, there was no variation in the cost estimates whether a project was in the Lynchburg district or in Hampton Roads.
- Right-of-way costs were calculated as a flat percentage of project costs. These costs were assumed to be the same percentage of a project’s costs whether it was in Bristol or in Northern Virginia.

Individually, some of these data and analytical issues could be overcome. However, in some instances resolving one issue raises another. For example, JLARC staff had access to more current traffic data that could have been used to update the congestion assessment. However, if the deficiency list had been updated, staff would have been unable to replicate the process VDOT used to exclude projects deemed not feasible using engineering judgment. Combined, these factors led JLARC staff to reject use of VDOT’s most recent

needs assessment to evaluate the equity of the current allocation formulas.

Exhibit 3 summarizes the shortcomings of VDOT's 2001 needs assessment.

VDOT NEEDS TO IMPROVE ITS NEEDS ASSESSMENT PROCESS

If a needs assessment is to be used to measure whether highway formulas equitably allocate transportation funds, it is essential that the assessment be objective and accurate. If instead the needs assessment is a "wish list" – a perception VDOT itself has promoted – neither elected officials nor the public can be expected to trust that the needs assessment provides an accurate portrayal of the distribution of transportation needs.

As detailed in the previous section, VDOT's recent needs assessment failed to use objective and up-to-date criteria. Future VDOT needs assessments must rigorously apply a strict set of objective criteria to identify deficiencies. The Federal Highway Administration has produced a model it uses for similar purposes. In the past year, FHWA also developed a state-specific model to assist state Departments of Transportation in the evaluation of their highway needs. One option for increasing the objectivity of Virginia's process would be to adopt the federal model, or another similar process developed by an outside source.

VDOT Must Develop an Objective Needs Assessment

In order to fulfill the legislative intent of the needs assessment requirement, VDOT needs to develop an objective needs assessment. VDOT should adopt a set of objective criteria to identify deficient road segments,

Exhibit 3 Shortcomings of VDOT's Needs Assessment	
Age of Data	<ul style="list-style-type: none"> • Average daily traffic (ADT) data generally no more current than 1994 • ADT data often extrapolated because VDOT discontinued count program in 1987 • "Present" ADT data not based on same year for all segments • No attempt was made to forecast ADT to a common year • Bridge deficiencies based on 1997 inspections even though data is updated continuously • Geometric deficiencies have not been evaluated since 1992-1993
Criteria Do Not Reflect Current Standards	<ul style="list-style-type: none"> • Capacity standards – the basis of congestion measurement – were not updated to reflect substantial changes in federal estimates of roadway capacity that had been made because old standards underestimated true capacity
Use of Subjective Criteria	<ul style="list-style-type: none"> • Deficient sections were excluded from assessment if staff felt an improvement was not viable • Additional deficiencies were added "by hand" if staff thought they were merited • Judgments for different areas of the State made by different people • Geometric deficiencies identified by sight, and rated as "poor" or "very poor" based on individuals' perspectives
Development of Improvement Costs	<ul style="list-style-type: none"> • Project costs developed based on very small samples and have not been verified since the early 1990s • Same construction costs were used statewide • Right-of-way costs calculated as a flat percentage of project costs, with no regional differentials
Source: JLARC staff analysis of VDOT's 2001 quinquennial needs submission and supporting documentation.	

limit the assessment to deficiencies identified using these criteria, and present its decision model along with the results of the needs assessments. The criteria selected should be based on engineering and economics standards. Types of factors that should be included are measures of congestion, safety, and geometric adequacy of the roads.

Because the needs assessment is not intended to be a tool for selection or prioritization of projects for construction, VDOT should not add projects intended to promote economic development, although economic development projects could be included in the six-year improvement program based on other priorities. In addition, VDOT should not include or exclude identified deficiencies based on whether staff believe a particular project will ever be built. Likewise, projects should not be added to the needs assessment simply because they are included in the six-year plan or on some other list of transportation priorities. Instead of helping to determine the distribution of needs, inclusion of these projects reflects where funds are currently allocated but does not necessarily reflect existing needs. No project should be included in the assessment unless it was identified using objective deficiency criteria.

During the course of this study, VDOT staff were forthcoming about the shortcomings of the 2001 assessment and provided examples of the subjectivity of the current process. Staff also indicated that they are developing a new system to improve the needs assessment process. However, because of a shortage of computer personnel at VDOT, and the number of other information system priorities within the department, staff indicated this process will not be

completed prior to the December 2002 deadline for the next needs assessment. In addition, it is unclear whether the VDOT process will produce the objective assessment contemplated.

Proven Needs Assessment System Is Available

Under federal law, the Federal Highway Administration (FHWA) produces a report documenting national level highway needs every two years. In support of this effort, FHWA has developed analytical tools to objectively assess highway needs. These models are available at no cost to VDOT and could be used to replace its existing needs identification process.

FHWA Has Model for Analysis of Highway Needs. Since 1968, the Federal Highway Administration (FHWA) has been required to report to Congress biennially on the condition and performance of the nation's highways and the investments required over a 20-year horizon. In essence, FHWA is required to produce an assessment of highway needs. The results of this analysis are published in a report titled *Status of the Nation's Highways, Bridges, and Transit: Conditions and Performance*. Over the years FHWA has developed progressively more advanced analytical tools to support this requirement.

In the 1970s, FHWA created and implemented a system called the Highway Performance and Monitoring System (HPMS) to collect data from the states on the performance of their highways. Each year VDOT and the other state departments of transportation are required to submit information on sample highway segments to FHWA to update HPMS. In 1989, Congress called for the U.S. Department of Transportation to expand its efforts beyond examination of

deficiencies and evaluate the costs and benefits of proposed highway improvements. To undertake this analysis, FHWA developed the Highway Economic Requirements System, or HERS.

HERS is a package of models used to analyze the HPMS data and produce an estimate of highway deficiencies. It examines the relationships among traffic volumes, capacity, pavement deterioration, speeds, accidents, curves, grades, and other highway attributes to identify deficiencies and select appropriate improvements. In addition to analyzing the state-collected condition data, the HERS model uses data gathered by other federal agencies to place a monetary value on many of the costs and benefits associated with transportation improvements, and to estimate future investment requirements. The HERS model evaluates potential improvements on each segment by comparing their construction costs with their benefits, including reductions in travel times, vehicle operating costs, and accidents to determine whether an improvement is warranted. The integration of economic and engineering principles is a unique strength of HERS previously not contained in needs assessments tools.

Since HERS was created, FHWA has consulted with experts to assess the model's reasonableness and to improve it. For example, in June 1999, FHWA convened a panel of economists and engineers from the public and private sectors to evaluate HERS. This panel reported that FHWA has strengthened the model over time and that recent refinements have increased its applicability and credibility.

GAO Found HERS to Be an Effective Way to Identify Highway Needs.

The United States General Accounting Office (GAO) has also reviewed the HERS system and found it to be an effective tool to assess highway needs. In June 2000 the GAO released a report on the HERS system. In that report, the GAO concluded:

The HERS model has several strengths that make it a unique and reasonable tool for estimating a general level of national highway investment requirements...We found no other transportation model that could assess benefits and costs of alternative improvement options at the national level...HERS estimates can be used as a general guide for the investment requirements of the nation's highways...and for assessing relative investment requirements over time.

In its assessment of HERS, the GAO did note a number of limitations of the HERS model, generally limited to imperfections in analytical elements beyond the scope of those attempted by VDOT. At the same time, the GAO went on to praise the FHWA for recognizing the limitations of HERS and taking ongoing steps to improve it. The GAO noted that the HERS system is “a substantial improvement over prior methodology of using purely engineering standards to identify deficiencies without regard to economic merit.”

Other States Have Customized HERS to Fit State-Specific Needs.

Over the years, HERS and earlier analytical tools used to analyze the HPMS data have been used not only by FHWA, but also by states, metropolitan planning organizations and local government agencies to assess the physical condition, safety, service, and efficiency of their respective highway systems. Two States, Indiana and Oregon, found the HERS model so useful that they hired an independent consultant to customize HERS to fulfill some of their state-

specific needs. Both Indiana and Oregon have used HERS to analyze every section of highway in their state system, not just the HPMS samples.

Indiana used its HERS model to analyze highway investment needs over a 25-year period. Indiana DOT also reported using its modified HERS model to analyze district-level highway investment needs within the state.

Oregon selected HERS as the tool for its multi-jurisdictional highway needs and finance study. Oregon reports having used HERS to define the current status of its highways, the existing backlog of highway deficiencies, and to estimate the investment requirements of its highway system. Among HERS' other benefits, Oregon cited its HERS model's effective use of cost-benefit analysis as a foundation for allocating resources between programs.

FHWA Recently Developed Software System Customized to Identify State-Level Needs. Based on its positive experience with the national-level HERS model and the widespread interest in adopting the model for state use, as indicated by the model's successful adaptation in Oregon and Indiana, FHWA decided to create a state-specific version of its HERS software, called HERS/ST, in 1999. FHWA stated, "the HERS/ST model will provide a common, objective platform for state DOTs to communicate with state legislatures and other officials regarding the impacts of alternative highway investment levels." In 2000 FHWA launched a pilot program to test the software and determine if it served the needs of the state highway departments. Twenty state departments of transportation elected to participate in the project; VDOT did not. FHWA has indicated that if

the HERS/ST pilot project shows that states view the HERS/ST model as a useful tool, it will upgrade the model for future users.

HERS System Could Be Used to Conduct Needs Assessment

VDOT could use the HERS software as the basis for its next needs assessment. HERS does have limitations, and it was not created to meet Virginia's specific purposes. The sample of highway segments would have to be expanded to include all functional classes of roads, or analysis of local roads would have to be conducted outside the model for VDOT to fulfill the legislatively mandated needs assessment requirement. However, this does not negate the benefits of this analytical tool, both technical and practical in nature. The General Assembly may wish to prescribe the methods and content of the needs assessment to ensure that VDOT uses an objective process to comprehensively assess highway needs.

Analytical Strengths of HERS Model. Analytically, HERS has a number of benefits over VDOT's current needs assessment process. First, the HERS software identifies deficiencies and then selects improvements based on cost-benefit analysis. This would provide a good alternative to exclusively using engineering standards or depending on professional judgment to exclude prohibitively expensive improvements. Because HERS incorporates cost-benefit analysis, VDOT would not need engineers with knowledge of roads across the State to review the deficiency list and subjectively exclude projects based on their high costs.

HERS also incorporates consideration of a variety of costs and benefits of highway improvements. Whereas VDOT has only been able to analyze the highway system using engineering standards and knowledge derived from professional experience, HERS includes quantitative consideration of the impacts of changes to the road network. These impacts include changes in operating costs, the value of time, emissions costs, and safety. It also considers changes in travel demand caused by improvements. VDOT does not have in-house expertise to develop its own models of these indirect impacts of highway construction.

One final unique feature of HERS that would improve VDOT's analytical capabilities is its ability to produce assessments of reconstruction and rehabilitation needs, something not captured by VDOT's needs assessment. Because VDOT has included only capacity and geometric analysis in its needs assessment, no attention has been paid to issues such as pavement condition and other items often viewed as maintenance issues. However, as the State's system of roadways ages, what previously were considered maintenance issues become high-cost construction projects. Interstate 81 demonstrates the importance of considering major reconstruction needs in a comprehensive assessment. The projected costs of necessary improvements to this interstate are substantial, but as VDOT staff noted, its needs assessment did not identify major needs along this corridor.

HERS Could Provide Objective and Regularly Updated Needs Assessment. In addition to the analytic strengths of the model, HERS provides a

number of practical benefits as well. One benefit of HERS is that because it was developed by an outside source and is based on rigorously reviewed models, it should not be viewed as a “wish list,” a perception that limits the credibility of VDOT’s current needs assessment. Use of HERS also could reduce the time and effort that VDOT has to devote to the needs assessment, because VDOT already collects the data used by HERS to fulfill federal requirements. Another benefit is that VDOT would be able to regularly update its needs assessment tool as the FHWA updates the models to reflect changing technology and conditions, with little direct cost to the agency. VDOT staff interviewed for this study mentioned that the generally accepted capacity formulas used to identify congestion deficiencies were substantially revised in 2000, but VDOT has not been able to revise its software to reflect these new standards. These new formulas already have been incorporated into HERS.

Limitations of HERS Would Have to Be Addressed

Because HERS was not developed for Virginia but for national analysis, it does have limitations. JLARC’s review of the software and the data accompanying it identified some shortcomings that would have to be addressed for VDOT to rely on HERS for the upcoming needs assessment. However, most of these limitations also apply to VDOT’s current methodology for conducting its needs assessment.

The first issue is that HERS does not include data on all functional classifications of roads. FHWA did not sample roads classified as rural minor collectors or local roads because they are not eligible for federal funding. The

absence of local road data can be addressed using alternative data sources, or by incorporating these roads into the HERS model. This is no worse than the current situation. VDOT currently analyzes these two categories of needs outside the parameters used to assess other roadways. The assessment of local road needs in VDOT's 2001 needs assessment was conducted outside the system used for other roads, and was completed at a different time.

Second, HERS does not include bridge deficiency analysis. At the national level, FHWA adds these deficiencies into the system from a separate bridge deficiency database. As is the case with the local roads, VDOT's assessment methodology also shares this limitation. VDOT currently adds bridge needs as a separate component of its needs analysis using different criteria. Bridge needs are identified by VDOT's bridge division on an annual basis in fulfillment of a federal requirement. This process does not need to change. The factors determining need on bridges differ from those for other types of roadways, and the federal deficiency rating system is well established.

Third, because the HPMS sample segments were selected to ensure a representational sample at the national level and not for Virginia alone, VDOT would have to expand the number of segments evaluated to ensure the data were reliable. In particular, although there appear to be sufficient segments to judge needs on a statewide basis, VDOT must ensure that the sample is large enough in each area of the State, if these data are to be used to distribute funds geographically.

**Purposes of Needs Assessment Cannot Be Filled
by Federal Long-Range Plan**

During the 2001 General Assembly Session, VDOT proposed legislation that effectively would have eliminated the quinquennial needs assessment. Although the legislation was substantially rewritten in committee, the language enacted may not result in the type of assessment that can be used to objectively analyze the relative distribution of highway needs in Virginia. During its presentation of the bill, VDOT management stated that it had proposed the legislation in an effort to reduce duplication by replacing the needs assessment with the long-range plan being developed to fulfill federal requirements. JLARC staff reviewed VDOT's most recent federal long-range plan and found that it was a collection of policy statements that included neither analysis of deficiencies nor the identification of needed improvements. Although VDOT has stated the new long-range plan will be far broader in scope, the two requirements serve different purposes.

The federal long-range plan requirement is one element of a larger set of procedures designed to guide project selection. As such, fiscal limitations and subjective policy decisions play a major role in the process. The federal government, recognizing a distinction between these two purposes, assesses highway needs through a separate process, not by compiling the long-range plans submitted by the states.

General Assembly May Wish to Amend Code of Virginia to Require Use of HERS or Comparable Needs Assessment Tool

As amended during the 2001 General Assembly session, §33.1-23.03 of the *Code of Virginia* reads:

The Commonwealth Transportation Board shall conduct a comprehensive review of statewide transportation needs in a Statewide Transportation Plan setting forth an inventory of all construction needs for all systems, and based on this inventory, establishing goals, objectives and priorities covering a twenty-year planning horizon, in accordance with federal transportation planning requirements. This plan shall embrace all modes of transportation and include technological initiatives. This Statewide Transportation Plan shall be updated as needed, but no less than once every five years. The plan will provide consideration of projects and policies affecting all transportation modes and promote economic development, intermodal connectivity, environmental quality, accessibility for people and freight, and transportation safety. Each such plan shall be summarized in a public document and made available to the general public upon presentation to the Governor and the General Assembly.

This language does not guarantee that VDOT will use objective criteria to identify highway deficiencies and appears to promote consideration of other subjective criteria. In light of the obvious deficiencies of VDOT's 2001 needs submittal (many identified by the department itself), and the broad scope of the existing Code language, the General Assembly may wish to modify §33.1-23.02 by enumerating the purposes of the quinquennial needs requirement and mandating use of HERS or a comparable analytical tool for a needs assessment, separate from long-range planning that is required.

Recommendation (6). The General Assembly may wish to consider amending §33.1-23.02 of the *Code of Virginia* to specify the purposes of the quinquennial needs assessment and require VDOT to use an objective, measurable tool, such as HERS or an equivalent, for the identification of highway deficiencies.

III. Allocation of Funds Among and Within Functional Roadway Systems

One of the primary aspects of this study was to examine the current formulas for the allocation of highway construction funds, which have been in effect since 1985. The allocation system and formulas proposed in this chapter for the distribution of highway construction funds follow the basic approach currently used to allocate funds, but also include substantial recommended modifications. The distribution of funds should continue to be based on highway construction needs. However, instead of allocating funds among the interstate, primary, secondary, and urban systems, funds should be allocated among the statewide, regional, and local systems proposed in the previous chapter. Further, in allocating funds proportionally among systems, federal and State funds should be included together in determining the proportional allocation among systems.

Like the current system, construction funds should be allocated within systems based on factors that serve as good proxies for need. However, Statewide system funds should be allocated on a project-by-project basis based on priorities. Regional funds should be allocated to the seven funding regions proposed (instead of primary construction districts), and the distribution formula should be based on registered vehicles in the regions instead of vehicle miles traveled and lane miles. Funds within the local system should be distributed to localities based on centerline miles and registered vehicles instead of population

and area, which are the factors currently used to distribute urban and secondary funds.

The proposed formula changes have several implications for the allocation of funds. With the proposed changes, more funds will be allocated to major roads systems than local roads. In addition, rural areas will receive additional local funds to address deficiencies on their roads, while the major urban areas of the State will receive the bulk of the regional funds.

In addition to these modifications to the current allocation formulas, a separate bridge fund is needed. Under the present system, bridge replacements are not adequately prioritized, and allocations are often not adequate to fund bridge replacements. Creating a separate State fund and allocating bridge funds based on bridge deficiencies will help to ensure that bridge deficiencies are properly prioritized and addressed.

ALLOCATION OF FUNDS SHOULD BE BASED ON NEED

There appears to be a general consensus among State and local transportation officials and professional staff that the allocation and distribution of highway construction funds should be based on need. Need should serve as the basis for the allocation of construction funds among roads systems as well as for the distribution of funds within systems. Based on the shortcomings of VDOT's most recent needs assessment and the advantages of using the Highway Economic Requirements System (HERS) model discussed in Chapter II, this model could be used as the basis for the development of the allocation formulas.

Need Appears to Be the Most Equitable and Efficient Basis for the Allocation of Funds

Based on interviews with transportation officials at the State and local level and comments received from local governments, there is a general consensus within the State that need should continue to serve as the basis for the allocation of highway construction funds. The only alternative means for allocating funds suggested during the course of this study would be to allocate funds based on revenue contributed by region and locality. A revenue-return basis would allocate State transportation funds to localities based on the amount of revenue raised by each locality. However, a revenue-return allocation system would have significant limitations.

A major limitation of such a proposed system would be the practical difficulty in calculating it. Motor fuels taxes constitute a large portion of State transportation revenues, but this revenue is not reported by locality. Prior to implementation of the Virginia Transportation Act, fuel taxes were collected at the distributor level. Now they are collected at the terminal or refinery. Thus, it is impossible to determine the number of gallons of fuel sold in each locality and the associated tax collected with each gallon sold.

Another limitation with using such a system is that it is in the interest of the entire State to have an effective road network. Residents in each area of the State directly benefit from roads built in other parts of the State. In assessing the viability of using a revenue-return basis for allocating funds, a 1993 VDOT study of the allocation formulas noted:

There will always be cross-subsidies – over time, systems and geographic areas. That is the nature of a system. It

links all parts of the Commonwealth and while not all parts can pay for themselves, it is in the interest of the entire state to connect rural with urban areas, collectors with arterials, roadways with rail lines, transit with highways, etc. The Virginia Department of Transportation is charged with the public welfare and with developing a balanced transportation system that provides basic mobility and goods movement for all its citizens, regardless of their ability to pay.

Given these limitations and the consensus among virtually all transportation officials that the allocation system should be based on need, the proposed allocation system in this report is a needs-based system.

Needs Assessment Can Serve as Basis for Allocation of Funds Among Systems as Well as to Distribute Funds within Systems

The current system for allocating funds was developed based on the results of the 1982 needs assessment. Under the proposed system, the needs assessment is also the basis for the allocation of funds among road systems as well as for the distribution of funds within systems. By quantifying the relative needs among each of the three major road systems – statewide, regional, and local – the appropriate amount can be allocated to each of these systems based on need.

The needs assessment also provides the basis for selection of proxies or factors, such as lane miles or registered vehicles, which can be used to equitably distribute construction funds within systems. By comparing the extent to which such factors correlate with transportation needs developed through a needs assessment, factors can be selected on which to base the distribution of highway construction funds.

HERS/ST Model Used to Estimate Needs Across Regions of the State

For the reasons set forth in Chapter II, the state version of the Highway Economic Requirements System (HERS/ST) model was used by JLARC staff to conduct a ten-year needs assessment of Virginia's highways. The HERS/ST model produced statewide highway needs estimates by functional class of roadway. The needs estimates were distributed across the seven funding regions using the amount of regional lane miles represented in the sample of road segments. The HERS needs assessment was then augmented to include local road needs and bridge needs.

HERS/ST Was Developed to Predict Highway Needs by Functional Class on a Statewide Basis. HERS/ST uses a sample of 2,588 highway sections across the State to calculate predicted highway needs over time. Based on the sample of highways, the model calculates total needs for each functional class by applying an expansion factor to the improvement costs of the sample roadways. The expansion factors are based on sample representation of functional class roadway miles and traffic volume on the roadways. HERS/ST also estimates highway needs for 18 different improvement types ranging from resurfacing to reconstruction with the addition of high-cost lanes. Resurfacing and minor shoulder improvements were not included in the needs assessment because these constitute maintenance instead of construction needs.

JLARC staff obtained the HERS/ST software from the Federal Highway Administration and calculated the cost of addressing deficiencies identified by the model. Table 5 shows the HERS/ST ten-year highway improvement needs by functional class, adjusted to 2001 dollars. The

Table 5	
HERS/ST Ten-Year Highway Construction Needs Estimates	
<u>Functional Class</u>	<u>Cost</u> <u>(Thousands</u> <u>of dollars)</u>
Rural Interstate	\$ 1,112,827
Rural Principal Arterial	1,659,877
Rural Minor Arterial	2,086,228
Rural Major Collector	4,440,189
Urban Interstate	5,059,455
Urban Other Freeway and Expressway	1,472,509
Urban Principal Arterial	8,397,875
Urban Minor Arterial	6,381,734
Urban Collector	1,359,635
Total	\$ 31,970,328
Note: This table does not include bridge replacement or local road needs.	
Source: Highway Economic Requirements System/State Version. U.S. Department of Transportation, Federal Highway Administration.	

\$32 billion total shown in Table 5 does not include bridge replacement needs and local road needs, which were determined using other means of assessment.

Modifications Were Made to the HERS/ST Model to Produce Regional and Local Roadway Needs Estimates. The HERS/ST model produces statewide needs by functional class. In its current form, it does not estimate needs within different regions of the State, nor does it differentiate needs between National Highway System (NHS) roads and other roads. Estimates of need were produced for funding regions and the NHS system based the proportion of lane miles in the sample road sections to total lane miles in each region. Appendix B provides a more detailed discussion of JLARC's methodology for the estimation of needs across regions and for NHS roads.

Ten-Year Needs Analysis Used to Estimate Proportional Needs. The HERS/ST model allows the user to specify the length of time for the analysis period. A ten-year needs period was selected instead of a longer period such as 15 or 20 years for several reasons. A shorter period was selected in order to prioritize existing and near-term needs. The ten-year period was also selected because projecting needs beyond ten years becomes increasingly speculative. Finally, it was selected because the State will likely be funding ten-year needs for the foreseeable future given currently forecast transportation revenues.

Local Road and Bridge Needs Added to Complete Needs Analysis. The HERS/ST model does not include local and rural minor collector roads, nor does it include an adequate assessment of bridge replacement and rehabilitation needs. Therefore, these needs were estimated using other means. Local and rural minor collector road needs were estimated using VDOT's assessment of non-tolerable secondary roads and data on unpaved roads. Bridge replacement and rehabilitation needs were estimated using federally defined bridge sufficiency ratings and the expected useful life span of bridges.

VDOT conducted a needs analysis of secondary local and rural minor collector roadways in 1999. This analysis measured the adequacy of these roads based on the minimum required pavement width for safe vehicle operation given the level of traffic on the road. Deficiencies based on congestion or capacity analysis are generally not present on rural local roads. The unpaved road needs are based on the cost of paving all unpaved roads in the State that carry on average more than 50 vehicles per day. VDOT did not conduct an

assessment of local road needs in cities and towns in the urban system or in the counties of Arlington and Henrico. Local road needs in these localities were estimated using a weighted average of urban local road needs per lane mile in the counties (Appendix B).

Also incorporated in the needs assessment were a portion of the State's bridge replacement needs. Estimated bridge needs are based on the per foot cost of replacing bridges with a sufficiency rating of 50 or below, based on a one to 100 rating scale developed by the Federal Highway Administration. Future bridge needs were determined based on the age of the bridge. Bridges that will be 75 years old by 2012 are included as future needs.

The needs assessment includes only 20 percent of the cost of these bridge needs. This is because under the proposed allocation system, a separate State bridge fund would be established that would fund 80 percent of the cost of bridge replacements. Only 20 percent of the cost would come from funds allocated through the formulas. Therefore, only 20 percent of the bridge needs have been included in developing the needs on which the formula allocations are based. The estimation of bridge needs and the establishment of a separate bridge fund are discussed in greater detail later in this chapter.

Sampling Should be Expanded for Future HERS/ST Needs

Assessments. The sample sizes for minor arterial and collector roads were substantially smaller than the principal arterial sample size. In the future, minor arterial and collector sample sizes should be increased to ensure the accuracy of the regional and local highway system needs estimates.

Recommendation (7). The Virginia Department of Transportation should increase the number of highway section samples that are collected as part of future Highway Economic Requirements System needs assessments to ensure that samples are representative of road needs in each functional classification and jurisdiction.

ALLOCATION OF CONSTRUCTION FUNDS AMONG STATEWIDE, REGIONAL, AND LOCAL SYSTEMS

After development of a needs assessment, the next step in the analysis of how to equitably distribute construction funds was to determine the amount of funds that should be proportionally allocated to the three major road systems. Just as the current allocation process is based on proportional needs among the primary, secondary, and urban systems, proportional needs should also form the basis for allocations among the proposed statewide, regional, and local systems. In contrast to the current system, this proportional allocation of funds among systems should be based on both federal and State construction funds, including federal interstate funds. Based on the analysis of proportional needs across functional roadway systems, more than one-third of available construction funds should be allocated to the statewide system, one-third should be allocated to the regional system, and the remainder should be allocated to the local system.

Estimation of Ten-Year Highway Construction Needs for Statewide, Regional, and Local Systems

The needs analysis was first used to assess the appropriate allocation of funds among the three road systems. The JLARC formula study conducted between 1982 and 1984 followed this same approach and recommended the proportion of funds to be apportioned to the primary, secondary, and urban

systems based on the proportional amount of needs in each system. The needs assessment for the current study was conducted using the HERS/ST model in conjunction with bridge needs and local secondary roads needs to determine proportional needs among the statewide, regional, and local roadway systems. Based on the functional class distribution of needs and the extent of National Highway System (NHS) miles in each functional class, proportional needs were determined for the three roadway systems.

Statewide System Needs. Statewide system needs consist of all NHS highway needs and 20 percent of NHS bridge replacement/rehabilitation needs. The statewide system's portion of the ten-year needs assessment is \$14.3 billion. Almost all of the NHS highway and bridge needs are on the interstate highway system and other principal arterial roads. Most of the remainder of NHS needs are on minor arterial roadways. Estimated needs of NHS bridges follow a similar pattern across the functional classes. Table 6 shows the estimated NHS highway and bridge needs by functional class.

Regional System Needs. Regional system needs consist of needs on arterial highways that are not part of the NHS system, as well as 20 percent of non-NHS arterial bridge needs. The regional system's portion of the ten-year needs is \$12.1 billion. As is shown in Table 7, 80 percent of all regional needs are on urban roads, and more than half of the regional needs are on urban minor arterials.

Local System Needs. Local system needs consist of non-NHS collector roadway needs generated by the HERS/ST model, 20 percent of non-

Table 6			
Ten-Year Statewide System Needs by Federal Functional Class			
Needs (Thousands of dollars)			
<u>Functional Class</u>	<u>Highway</u>	<u>Bridge</u>	<u>Total</u>
Rural Principal Arterial	\$ 2,516,630	\$ 28,951	\$ 2,545,581
Rural Minor Arterial	70,625	1,942	72,567
Rural Major Collector	8,951	657	9,608
Urban Principal Arterial	11,348,801	67,894	11,416,695
Urban Minor Arterial	279,667	1,034	280,701
Urban Collector	2,845	0	2,845
Total	\$ 14,227,518	\$ 100,479	\$ 14,327,997
Source: JLARC analysis of HERS/ST ten-year needs assessment and federal bridge sufficiency criteria.			

Table 7			
Ten-Year Regional System Needs by Federal Functional Class			
Needs (Thousands of dollars)			
<u>Functional Class</u>	<u>Highway</u>	<u>Bridge</u>	<u>Total</u>
Rural Principal Arterial	\$ 256,074	\$ 16,164	\$ 272,237
Rural Minor Arterial	2,015,603	87,830	2,103,434
Urban Principal Arterial	3,581,038	23,373	3,604,411
Urban Minor Arterial	6,102,067	48,332	6,150,399
Total	\$ 11,954,782	\$ 175,699	\$ 12,130,481
Source: JLARC analysis of HERS/ST ten-year needs assessment and federal bridge sufficiency criteria.			

NHS collector and local bridge needs, and non-tolerable local and rural minor collector road needs (including unpaved road needs). Non-tolerable criteria are based on two factors: road width and traffic volume. A road is considered to be non-tolerable if it does not meet the minimum road width requirement, which is based on the volume of traffic on the road. The local system's portion of the ten-

year needs assessment is nearly \$10 billion. Approximately 80 percent of the local system road needs are in the rural functional classes.

Rural needs appear to outnumber urban needs for several reasons. Most local system road deficiencies are related to safety rather than congestion. According to VDOT staff, traffic volume on local roadways tends to be fairly stable, especially in urbanized areas. In addition, there are three times as many rural local system roads as there are urban local system roads. Finally, local road needs include unpaved road needs, which tend to be predominantly in rural areas. Table 8 shows the breakdown of local system needs by functional class.

Proportional Allocation to Statewide, Regional, and Local Systems Should Be Proportional to Need

The total construction needs of each system provided the basis for determining the proportional allocation among the statewide, regional, and local

Table 8 Ten-Year Local System Needs by Federal Functional Class				
<u>Functional Class</u>	Needs (in thousands)			
	<u>HERS/ST</u>	<u>Bridge</u>	<u>Non-Tolerable</u>	<u>Total</u>
Rural Collector	\$4,431,238	\$82,882		\$4,514,120
Rural Local		60,075	\$3,357,197*	3,417,272
Urban Collector	1,356,790	11,354		1,368,144
Urban Local		11,886	645,416	657,302
Total	\$5,788,028	\$166,197	\$4,002,614	\$9,956,838
* Includes rural minor collector non-tolerable roadways.				
Source: JLARC analysis of HERS/ST ten-year needs assessment and federal bridge sufficiency criteria.				

systems. As Table 9 shows, 39.4 percent of the needs are on the statewide system, 33.3 percent are on the regional system, and 27.3 percent are on the local system. Given these relative needs, available construction funds should be allocated in these same proportions.

Total ten-year highway construction needs are estimated to be \$36.4 billion. As discussed earlier, ten-year needs were used as the basis for determining proportional needs across highway systems, funding regions, and localities. Twenty-year highway construction needs were also estimated for the purpose of assessing funding adequacy, which is discussed in Chapter IV of this report. Twenty-year needs are estimated to be \$58.3 billion.

State and Federal Funds Should Be Allocated to Highway Systems Based on Proportional Needs

Transportation funding in Virginia currently is not allocated using one formula. Instead, separate formulas are used to allocate State and federal funds,

Table 9 Ten-Year Proportional Highway Construction Needs for Statewide, Regional, and Local Systems		
<u>System</u>	<u>10-Year Needs</u>	<u>Proportional Needs</u>
Statewide	\$ 14,327,996,710	39.4%
Regional	12,130,480,595	33.3%
Local	9,956,838,446	27.3%
Total	\$ 36,415,315,751	100%
Source: JLARC analysis of HERS/ST ten-year needs assessment and federal bridge sufficiency criteria.		

to distribute monies to highways, transit, and other modes, and to allocate funds within specific highway and transit programs. Under Virginia law, State and federal funds have largely been considered discrete fund sources, and State allocations among the three State road systems through the 40-30-30 formula are made largely without consideration of where federal funding is spent. Most federal funds are allocated among systems based on federal requirements and not based on need. Therefore, with most federal funds allocated outside of the needs-based 40-30-30 formula, there is no mechanism in place to ensure that construction funds as a whole are allocated proportionally based on need.

The proposed allocation system would combine federal and State revenues for use in the formula. With the flexibility now provided in the use of federal funds, most of these funds can be easily combined with State funds for purposes of allocating the funds proportionally among the road systems. By including most federal funds in the proportional allocation, the State can better ensure that construction funds as a whole are proportionally allocated to systems based on the systems' needs.

Some categories of funds should still be excluded from the State allocation formula because of federal restrictions on how the funds can be spent. Federal funds that should be excluded include: (1) Congestion Mitigation and Air Quality funds, which are intended to be spent in the three major urban areas of the State on projects that improve air quality; (2) Bridge Replacement and Rehabilitation Funds, which are proposed to be allocated to a separate State bridge fund; (3) the portion of STP funds set aside for safety and enhancement

projects; and (4) demonstration project and corridor bond funds that are designated for specific projects.

Dollar Amounts Allocated to Each System Based on FY 2001 Revenue

Based on VDOT revenue data, it is estimated that there would have been \$879 million dollars to allocate through the proposed State formula in FY 2001. Based on the proportional amounts, the statewide system would have been allocated \$346 million, the regional system \$293 million, and the local system \$240 million. Table 10 shows the dollar amounts that would have been allocated to the three road systems under the proposed formula. Based on the recommended changes to the road classification system and the updated needs assessment, the General Assembly may wish to consider amending the *Code of Virginia* to require that State and federal highway construction funds be proportionally allocated to the proposed roads systems based on relative need.

Table 10		
Allocations by System Based on FY 2001 Construction Revenue		
<u>Road System</u>	<u>Amount Allocated</u>	<u>Percent</u>
Statewide	\$345,773,447	39.4
Regional	292,741,419	33.3
Local	240,285,534	27.3
Total	\$ 878,800,400	100%
Note: Total excludes CMAQ funds, Bridge Replacement and Rehabilitation funds, demonstration and corridor bond funds, and the portion of STP funds that are set aside for safety and enhancement projects.		
Source: JLARC staff analysis of VDOT data.		

Recommendation (8). The General Assembly may wish to consider amending Article 1.1 of Title 33 of the *Code of Virginia* to require that State and federal highway construction funds, with certain specific exceptions, be allocated among the statewide, regional, and local systems based on the proportional highway construction needs of each system.

ALLOCATION OF CONSTRUCTION FUNDS WITHIN THREE PROPOSED SYSEMS

Once the proportional funding allocations for the statewide, regional, and local systems have been established, the other aspect of the development of an allocation system is to determine the equitable and efficient allocation of funds within the three major road systems. Statewide system allocations should be made on a project-by-project basis based on system priorities. The regional and local funds should be distributed among the regions and localities based on relative needs within the systems. Instead of distributing the funds based directly on need, the funds should be distributed within the systems based on factors that serve as proxies for need. Based on an analysis of the relationships between various proxies and system needs, the number of registered vehicles is the most equitable factor on which to allocate regional system funds among regions. A combination of centerline mileage and registered vehicles results in the most equitable formula for distributing local system funds among localities.

CTB Would Determine How to Allocate Statewide System Funds

Under the proposed functional classification system, approximately 40 percent of available highway construction revenues are reserved for the Statewide system. The Commonwealth Transportation Board (CTB) would be responsible for allocating these funds to projects of statewide significance. The

CTB follows this approach under the current system in allocating federal interstate/NHS funds. This approach would allow the CTB to examine the statewide system as a whole and decide how best to allocate statewide system funds on a project level to meet the highest priority needs.

Given the substantial amount of funds that would be allocated on a project basis and the importance of allocating these funds to meet the greatest needs on the statewide network, it may be useful to develop a prioritization system to better ensure that funds are being allocated to the highest priority projects. In 2000, the Governor's Commission on Transportation Policy recommended the development of a prioritization system for the selection of highway projects. Such a system could serve as the basis for the allocation of funds within the statewide system.

Recommendation (9). The Commonwealth Transportation Board should allocate statewide system funds on a project-by-project basis based on a prioritization of statewide system needs.

Using Proxies for Need Is the Most Equitable and Efficient Means to Allocate Funds Within Regional and Local Systems

While the allocation formula for the proportional allocation among the three highway systems is based directly on the proportional needs of the systems, basing annual allocations to regions and localities directly on relative needs within the systems would not be practical. It would be inefficient to conduct a comprehensive needs assessment annually for the purpose of allocating regional and local funds. In addition, allocating funds based directly on annual needs assessments would result in uneven allocations of funds as needs across regions and localities fluctuated. This would be problematic given that

transportation projects usually require several years to plan and construct and thus require a stable source of revenue over an extended period.

The best alternative to basing allocations within the systems directly on need is to base the allocations on factors that serve as proxies for need, such as lane mileage or registered vehicles. The current primary, urban, and secondary distribution formulas are based on factors that serve as proxies for need.

Vehicle miles traveled and lane miles are the current factors used to distribute primary system funds, and population and land area are the factors used to distribute secondary and urban funds.

Using proxies for need has several benefits. Factor data on proxies such as lane miles and registered vehicles can be obtained easily and updated on an annual basis. In addition, proxies are more objective measures than direct needs. Finally, allocations based on proxies are likely to be more stable over time and fluctuate less from year to year.

Methodology for Selection of Proxies Used for Allocation of Funds

The selection of factors to serve as proxies for transportation needs was based on data analysis of numerous demographic and transportation-related factors that might predict need within the proposed regional and local systems. The factors identified for data analysis were based on literature reviews and input from transportation officials. Statistical methods were then applied to analyze the relationships between identified factors and highway construction needs and to develop formulas based on a factor or combination of factors that best reflects the relative distribution of needs.

Identification of Possible Factors for Use as Proxies. A list of possible proxies was compiled through a review of transportation literature, advice from State and local officials, and an assessment of available data. JLARC staff collected data from the Weldon Cooper Center for Public Service, the U.S. Census Bureau, the Department of Motor Vehicles, and VDOT. The factors chosen for initial review generally relate to highway system demand, highway system size, or some other descriptive characteristic that could be useful in explaining differences in needs across regions of the State. Table 11 shows the factors compiled by JLARC for further analysis.

System demand factors generally relate to congestion levels on highways. These factors measure traffic demand or population. Measures such

Table 11	
Factors Considered for Use as Proxy for Need	
<u>System Demand Factors</u>	
Population (2000)	Registered vehicles
Population change (1990-2000)	Licensed drivers
Projected population (2010)	Vehicle miles traveled
Population Density	Vehicles per lane mile
Employment	Population per lane mile
Number of Business Establishments	
<u>System Size Factors</u>	
Land Area	Lane miles
Centerline miles	
<u>Other Factors</u>	
Accident rate	Poverty rate
Acres of farmland	Per capita income
Source: JLARC staff analysis of factors.	

as vehicle miles traveled (VMT) and vehicles per lane mile are factors that measure travel demand either directly or indirectly. Total registered vehicles and population are indirect measures of travel demand within an area. Total employment and number of business establishments are also indicators of travel demand.

System size factors, including land area, lane miles (includes number of lanes and length), and centerline miles (length of the road without regard to the number of lanes) were identified as possible proxies because of their relationship to the scope of the roadway networks within regions and local government jurisdictions. Areas with more centerline miles or lane miles have more road miles and the potential for more deficiencies. Similarly, regions or localities with large land areas may have greater needs because a larger road network is needed to connect the entire area.

Other factors were considered that were not directly related to system demand or size. They included such factors as accident rates, which indicates the safety of the road; per capita income and poverty rate, which are both measures of economic condition; and farmland acres, which measures the level of urbanization of a region.

Analysis of Factors. The factors listed above were analyzed to assess how well they approximated transportation need using statistical analysis. Each of the factors was tested to determine the extent to which it correlated with regional and local transportation needs in each of the seven proposed funding regions. Needs by region had to be used both for the regional and local analysis

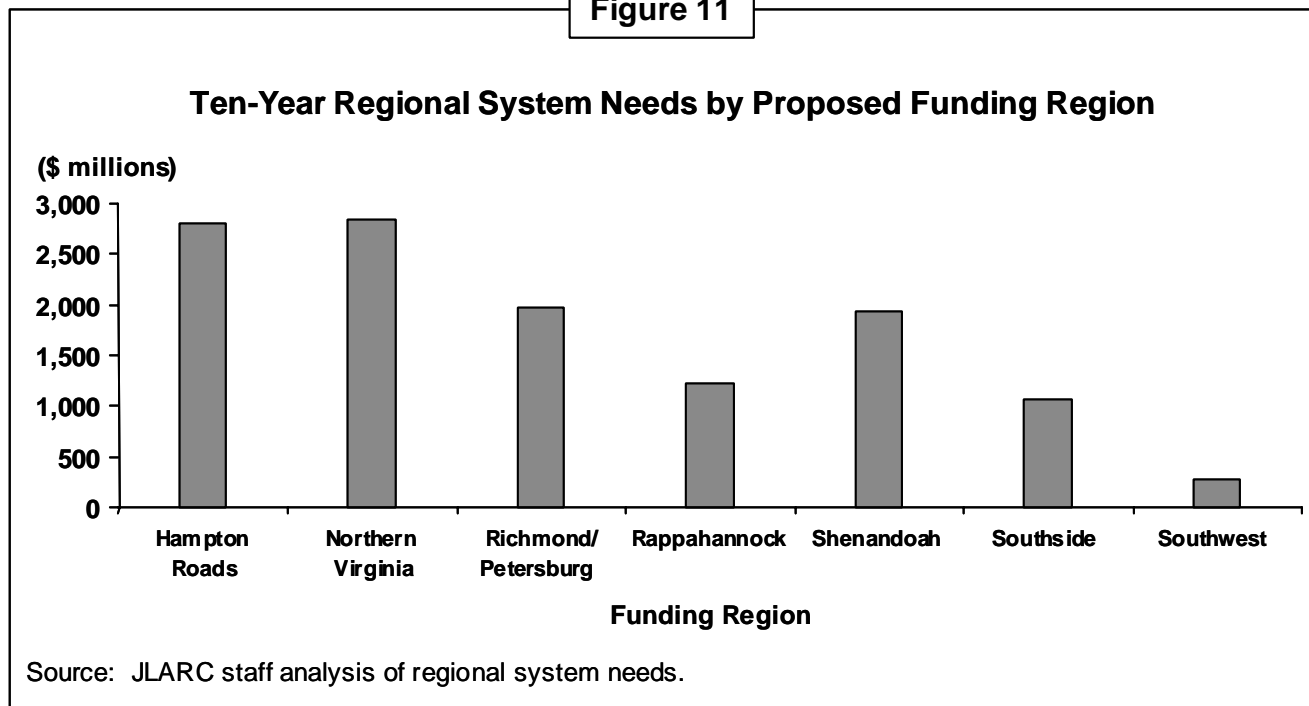
because there were insufficient data on the local system needs at the locality level to examine the association between the proposed factors and needs at the local level. Combinations of factors were analyzed to determine whether they might serve as better proxies of need than single factors. Appendix B provides a detailed discussion of the methodology used to select the formula factors.

Allocation of Regional System Funds Should Be Based on Registered Vehicles

The proposed allocation of regional system funds to the seven funding regions is based on the analysis of regional system needs and several potential proxies. Each of the proxies was compared to regional system highway construction needs across the seven regions. The analysis showed that the system demand factors such as vehicle miles traveled and registered vehicles were highly related to regional system needs, while the system size factors had little relationship to regional needs.

Regional System Needs Within Proposed Funding Regions. The highway construction needs estimates produced by the HERS/ST model and JLARC staff's analysis of deficient bridges show a concentration of regional system needs in the urban areas of Northern Virginia, Hampton Roads, and the Richmond/Tri-cities MPOs. These areas have an extensive minor arterial road network and high volumes of traffic using these roads. Many of the needs on these roads result from deficiencies based on congestion measures. Figure 11 shows the relative highway construction needs for each region.

Statistical Analysis of Factors. Correlation analysis was applied to determine relationships between regional system needs and the factors identified

Figure 11

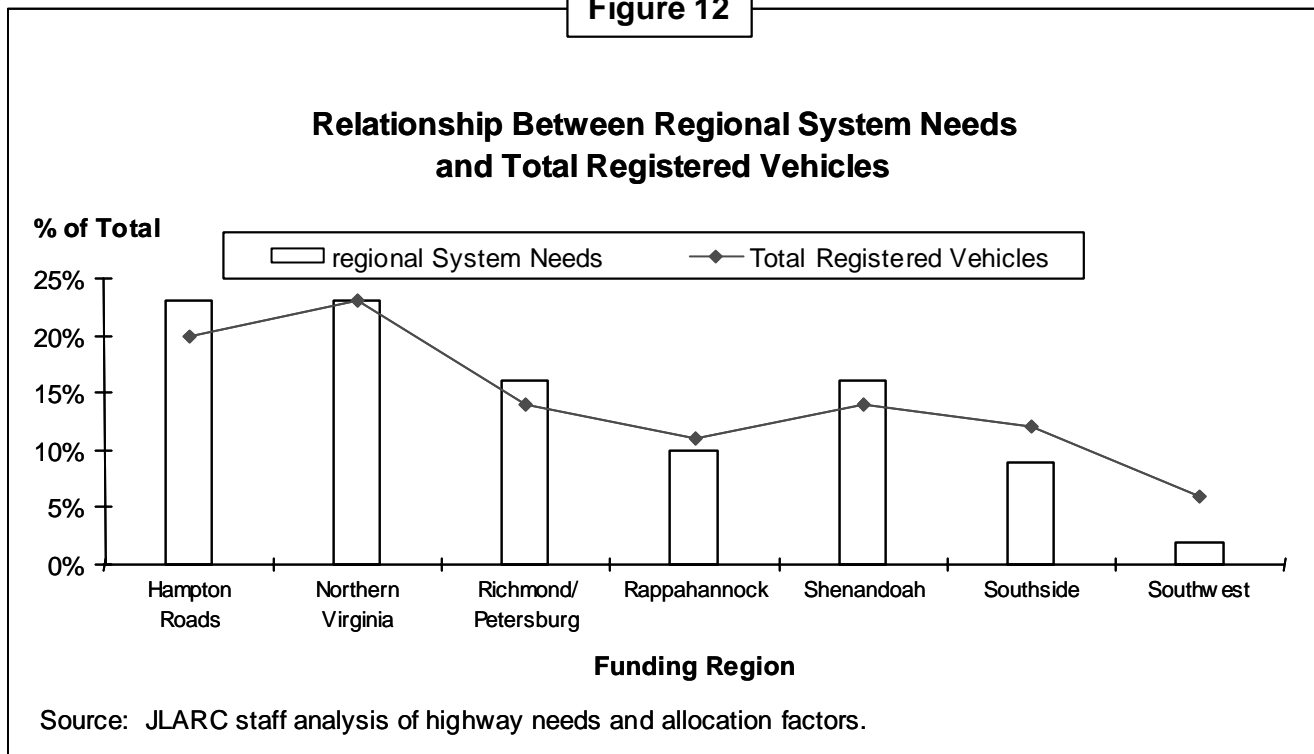
as possible proxies. The system demand factors had high positive correlations with regional needs, while the system size factors were either independent of or negatively correlated with regional needs. Of the system demand factors tested, total registered vehicles had the strongest association with regional needs. The other system demand factors were highly correlated with total registered vehicles, but were not more strongly associated with needs.

The system size factors that were shown to be independent of total registered vehicles were tested in regression models in combination with total registered vehicles to determine if any of these combinations of factors would be more highly associated with regional system needs. None of the regression models that included a system size factor along with total registered vehicles were more strongly associated with system needs than registered vehicles alone. (See Appendix B for a more detailed discussion of this analysis).

An allocation of regional system funds based solely on total registered vehicles would distribute funds to the seven regions in a manner that closely approximates the proportional needs of the regions. This close relationship between registered vehicles and regional system needs is shown in Figure 12.

Total Registered Vehicles Appears to Be Best Proxy for Regional Need. Based on its association with regional needs, total registered vehicles should serve as the proxy for the distribution of regional system construction funds. It is a factor for which the necessary data can be easily collected and verified, it is updated annually by the Department of Motor Vehicles, and it is easily understood. Moreover, it has advantages over vehicle miles traveled (VMT), which was another factor that was highly correlated with regional system

Figure 12



needs. VMT cannot be as easily collected. In addition, in the major urban areas the federal government has established incentives to encourage reductions in VMT in order to improve air quality.

Allocation of Funds to Regions Based on FY 2001 Highway

Construction Revenues. As discussed previously, the proportional allocation to the regional system would be 33.3 percent of available highway construction funds, or \$293 million based on funding available in FY 2001. The breakdown of regional system funds across the funding regions, using total registered vehicles as the basis for distribution, is shown in Table 12.

Recommendation (10). The General Assembly may wish to consider requiring that regional system funds be allocated among the seven proposed funding regions based on the total registered vehicles in each funding region.

Table 12	
FY 2001 Proposed Regional System Allocations Based on Total Registered Vehicles	
<u>Funding Region</u>	<u>Allocation</u>
Hampton Roads	\$57,155,474
Northern Virginia	67,840,407
Richmond/Petersburg	41,971,992
Rappahannock	32,974,998
Shenandoah	40,148,986
Southside	34,000,701
Southwest	18,648,860
Total	\$292,741,419
Source: JLARC staff analysis.	

Allocation of Local System Funds

Like the regional system, the proposed allocation formula for the allocation of local system funds to the localities is based on the results of an analysis of the association between local system needs and several factors considered. Local system needs also had to be aggregated by funding region and the factors summed to the regional level to conduct the analysis. The analysis revealed that system size factors such as centerline miles and area were highly correlated with local system needs but that demand factors were not.

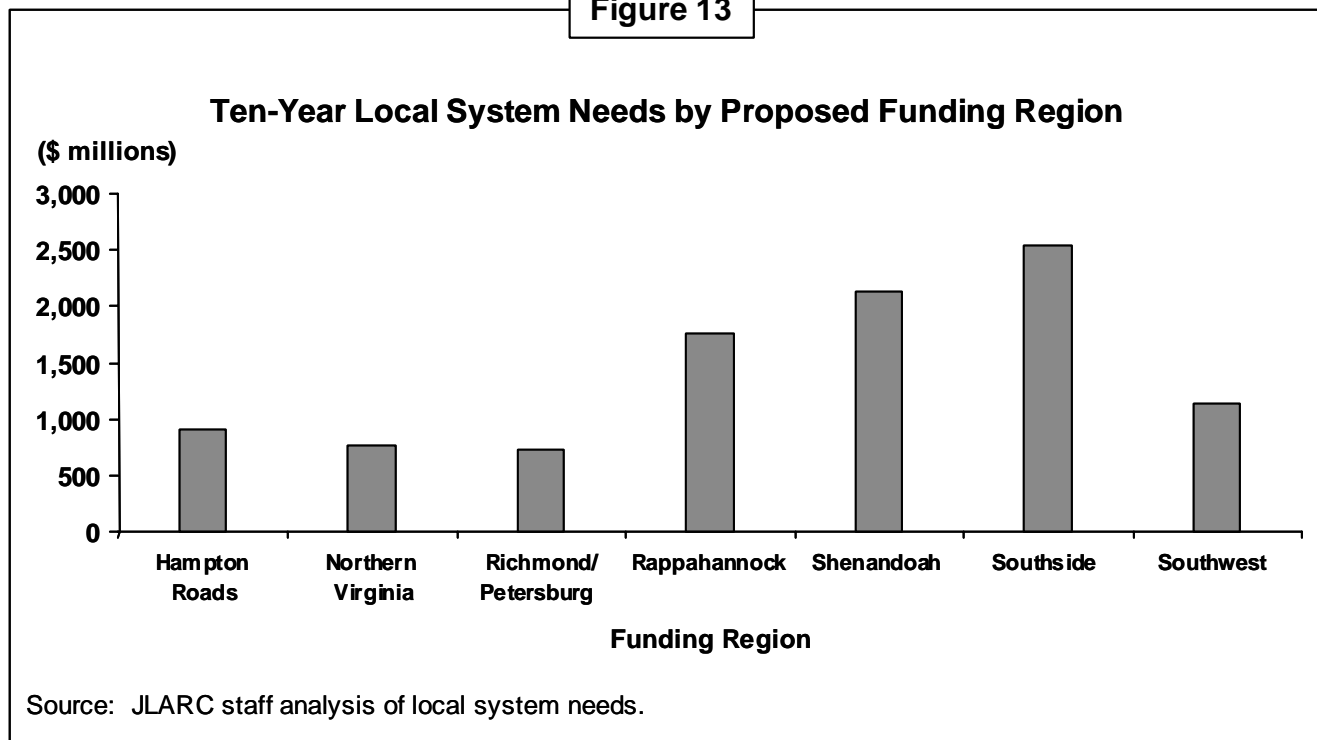
Funding Regions Used as Units of Observation for Local System Needs. Given the relatively small number of local system highway section samples in the HERS/ST analysis, it was not possible to estimate needs at the locality level. Therefore local system data had to be aggregated to the regional level and the funding regions used for testing the relationship between the various factors and local system needs.

A key assumption in the analysis is that relationships between the factors and local system needs will be the same at the locality level as they are at the regional level. An analysis of needs at the locality level would account for differences between localities within the same funding region and similarities between localities in different funding regions. To ensure that there are not major differences based on using local needs aggregated to the regional level, additional local system samples should be collected in the future so that the analysis can be conducted at the locality level.

Local System Needs Within Funding Regions. The assessment of local needs, which is based on HERS/ST, bridge deficiency criteria, and the

VDOT non-tolerable assessment, shows a concentration of local system needs in the rural areas. Figure 13 shows that most of the local needs are in the four more rural funding regions. As mentioned previously, this appears to result from the fact that most local system needs are safety deficiencies rather than congestion deficiencies, and the vast majority of local system lane miles are in rural areas.

Statistical Analysis of Factors. Analysis of factors with local system needs revealed that the system size factors are highly related to need, while the system demand factors are not. Centerline miles was the system size factor that had the strongest relationship with need. Local system lane miles and land area also had strong associations. Because centerline miles had the strongest relationship with need, it was chosen for further analysis.

Figure 13

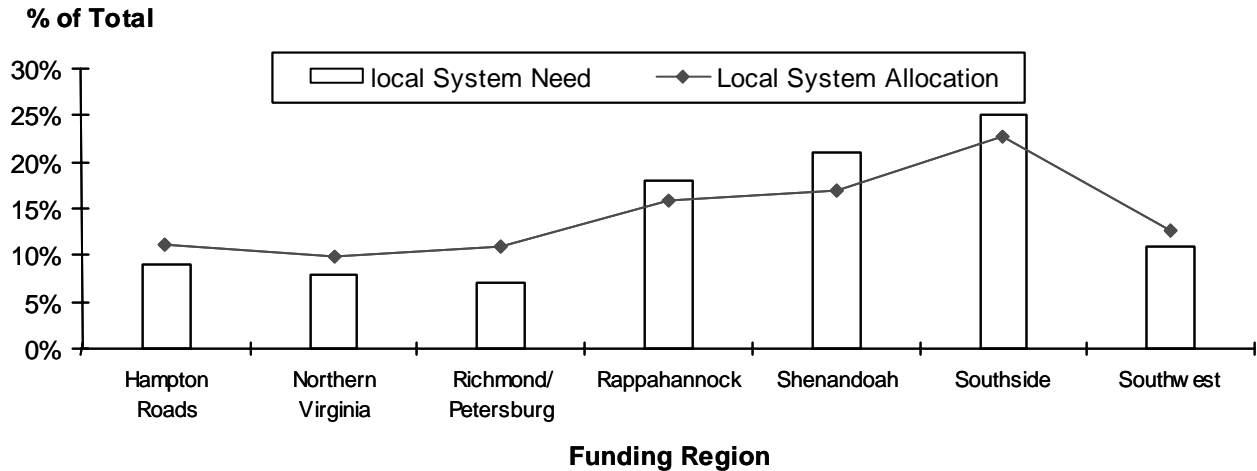
Local system centerline miles were not highly correlated with several of the system demand factors, including population, VMT, total registered vehicles, and licensed drivers. Each of these system demand factors was used along with centerline miles to determine if a combination of factors would provide a closer approximation of local system need than centerline miles alone. The combination of centerline miles and total registered vehicles did have a stronger relationship with local system needs. Factor weights were then assigned to the two factors based on how strongly associated they were with needs in comparison to each other. Based on the analysis, centerline miles should be assigned a weight of 86 percent and total registered vehicles a weight of 14 percent. Therefore, the available local system funds should be allocated among localities by distributing 86 percent of the funds based on each locality's percentage of the statewide total local system centerline miles, and 14 percent of the funds according to each locality's percentage of statewide total registered vehicles. Appendix B provides a more detailed discussion of the analysis and its results.

The allocation of local system funds based on centerline miles and total registered vehicles would distribute funds in a manner that would closely relate to the local needs of the proposed funding regions. This approximation of local system needs by allocations based on centerline miles and total registered vehicles is shown in Figure 14.

Combination of Local System Centerline Miles and Total Registered Vehicles Appears to Be the Best Proxy for Local System Needs. Of the three

Figure 14

Relationship Between Proportional Local System Needs and Allocations



Source: JLARC staff analysis of highway needs and allocation factors.

system size variables that are highly correlated with local system needs, local system centerline miles appears to be the most appropriate for use as a proxy. It has the strongest association with local system needs. In addition, it is a factor for which the data can be easily collected and verified. Lane miles and land area are also system size variables that had strong associations with local system needs, but both have limitations. Lane miles as a factor would be problematic, because localities that constructed additional lane miles to address deficiencies would receive additional future funds as a result of these added lane miles, although their needs should have been reduced by this construction. In addition, land area does not as precisely measure the size of a local road system as does the actual mileage of the system and would likely not serve as a good proxy for cities with relatively small geographic areas but extensive local road systems.

Total registered vehicles is the optimal demand factor to use in combination with centerline miles to distribute local system funds. Registered vehicles, combined with centerline miles, had a stronger relationship with local system needs than any other demand factor combined with centerline miles, and than centerline miles alone. Moreover, it is preferable to VMT because it is more easily collectable, verifiable, and is regularly updated.

***Recommendation (11).* The General Assembly may wish to consider requiring that 86 percent of local system funds be allocated among counties, cities, and towns based on each locality's proportion of local system centerline miles, and 14 percent of local system funds be allocated based on each locality's proportion of total registered vehicles.**

Unpaved Roads Should Be Funded Through Local Allocations

Under the proposed allocation system, the unpaved roads fund would be combined with other local road funds. Thus, unpaved road needs would be considered as part of the overall needs assessment. Because unpaved road needs are included in the needs assessment, these needs affect the allocation formulas by increasing the local system needs in rural areas, and by increasing local system needs relative to statewide and regional system needs. Due to the presence of unpaved road needs in the analysis, the importance of the system demand variables such as total registered vehicles and population were diminished, and the effect of system size variables such as centerline miles were increased. Therefore, given the high weight assigned to centerline miles and the relatively low weight assigned to registered vehicles in the formula, rural counties with a larger share of unpaved roads will receive a larger portion of the local system allocation.

Combining the unpaved roads fund with other local roads will provide greater flexibility to counties in meeting their own transportation needs. If counties wish to spend their allocation on improvements other than on unpaved roads, they will not be penalized as they are under the current system. Each county could determine the relative importance of paving unpaved roads within its jurisdiction. For the reasons discussed, the General Assembly may wish to consider requiring that unpaved roads be included in an overall needs assessment for local roads.

Recommendation (12). The General Assembly may wish to consider giving counties greater flexibility in meeting local road needs by combining local system and unpaved road funds in a single fund.

IMPLICATIONS OF CHANGING FORMULAS

The proposed changes to the allocation system would impact substantially the allocation of highway construction funds. The proposed changes would have this impact because of shortcomings in the current system. The current administrative classification system is antiquated and somewhat arbitrary, and the current formulas no longer allocate funds based on existing needs. Therefore, the proposed new allocation system, which would classify roads based on functional purpose and would allocate construction funds based on need, inevitably would change the allocation of construction funds considerably. With the greatest needs on the major roads, the proposed formula allocates a larger proportion of funds to these roads, and less funds are allocated for local roads which have fewer needs. In addition, the formulas would allocate

more regional funds to urban areas which have greater regional road needs and more local funds to rural localities which have greater local road needs.

**Proposed Modifications to Highway Systems
Would Shift Control of Mileage**

As discussed in detail in Chapter II, distributing funds to systems of roadways that serve similar purposes and carry similar traffic loads would improve the equity and efficiency of funding distributions. The State's primary, secondary and urban systems are administrative, not functionally based systems. The administrative systems are artifacts of the early 20th century, and bear little relationship to the purposes served by specific roadways today. Under the current administrative system, for example, both collectors and principal arterials compete for primary funds within a VDOT district, even though one might be a two-lane locally oriented road, and the other a National Highway System route.

This report recommends that funds for the current interstate, primary, urban, and secondary systems be distributed among new statewide, regional, and local funding categories, based on the functional classification of a given road. Replacing the administrative systems with a functional classification system would shift mileage among the categories and transfer all higher cost roads to the proposed statewide system.

Under the JLARC staff proposal, approximately 38 percent of the existing primary system would be in the new statewide system, 36 percent would become part of the regional system, and the remaining 26 percent would become part of the local system. Similarly, 15 percent of the current urban system would be placed in the proposed regional system, 10 percent in the statewide system,

and the remainder (75 percent) in the new local system. The secondary system would change in size the least; two percent of the lane miles would go into the regional system, less than one percent to the statewide system, while the vast majority would become part of the local system. Changing the relative size of the systems to which highway construction funds are allocated changes the distribution of needs among the systems and, consequently, the proportion of total funding that should be allocated to each.

**If Formulas Are Modified, Additional Funding
Would Go to Statewide Roads**

The needs assessment completed for this study indicates that about 39 percent of the needs are on the statewide system. Therefore, a major portion of construction funds would be allocated to these priority roads. Although the proposed statewide system contains less than ten percent of the lane miles in the State, it carries 50 percent of the total traffic. Furthermore, roads on the proposed statewide system are major roadways that are expensive to improve, as evidenced by the cost of the Springfield Interchange project in Northern Virginia and the proposed rehabilitation of I-81.

In addition to carrying half the traffic in the State, a comparison of the level of congestion on Virginia's principal arterial system to that in the rest of the country indicates that Virginia's major roads are substantially more congested than the average and thus need to be a higher funding priority. Nationally, 21 percent of urban principal arterials have volume to service volume ratios that indicate serious congestion. Volume to service volume ratios compare a road's maximum capacity with its actual volumes. In Virginia, 30 percent of urban

principal arterials are congested using this measure. On rural roads the differential is even greater; nationally, only three percent of rural principal arterials are congested, whereas 10 percent of Virginia's principal rural routes are congested.

The General Assembly's recent action to designate a Priority Transportation Fund appears to reflect the fact that the current system is not allocating sufficient funds to address major road needs. Most of the projects designated by the legislature as priority projects are projects on major roadways for which the General Assembly wanted to allocate additional funding.

If Formulas Are Modified, Less Funding Would Go to Local System

As a result of the inclusion of interstate miles in the statewide system and the creation of a new regional funding category, under the proposed system a smaller proportion of funding would go to the local system of roads. The two primary reasons for this are that the relative proportion of local needs has declined relative to needs on the higher systems since the formulas were last evaluated, and the proposed local system contains fewer miles than the existing secondary and urban systems.

Relative Share of Local Needs Has Declined. The needs assessment conducted pursuant to this study indicates that construction funding requirements of the local system comprise only 27 percent of the total highway needs. These results suggest that on a proportional basis, local roads have been receiving allocations in excess of their share of highway construction needs. In part, this is because interstate needs have been excluded from the assessment in the past.

Moreover, a review of the methodologies used to identify local needs in prior years indicates that local needs were not identified using objective criteria, particularly in urbanized areas. Instead, local governments were able to submit “wish lists” of projects. Inclusion of subjectively identified projects could have resulted in a relative overestimation of local needs in the past.

Local System Has Fewer Lane Miles. Another reason that less funding would go to the local funding category is that local needs comprise a smaller proportion of the total needs because the local system itself is smaller. Further, the roads that have been transferred away from the urban and secondary systems are the arterials. Because they have more lanes, arterial roads are wider, carry far heavier traffic, and generally are far more expensive to construct or widen than are local roads. In its needs assessment, VDOT estimated the per mile cost of local roads at between 500,000 and a million dollars; in contrast, urban principal arterials were estimated to cost \$5 million per mile. By removing the high cost roads from the urban and secondary systems, their share of total local system needs declines.

More Local System Needs in Non-Urbanized Areas. Because earlier assessments relied in part upon project listings to identify needs, it appears that rural safety needs may have been underestimated relative to local needs in urbanized areas. The resulting distribution of local needs favored distributing funding to the urban localities, not the rural ones. However, fully 80 percent of the local and collector needs identified by HERS and the non-tolerable ratings are in nonurbanized areas. Selecting appropriate factors for distributing funds

based on this needs analysis results in the use of factors based more on the breadth of local systems (which benefits rural areas), not the extent of use.

These findings are supported by a recent study released by the U.S. Government Accounting Office (GAO). In its report the GAO noted that although only about 40 percent of all travel occurs on rural roads, about 60 percent of fatalities took place on these roads. When adjusted for vehicle miles traveled, the fatality rate from traffic accidents on rural roads was nearly 2.5 times greater than the fatality rate from accidents on urban roads.

The shift from the administrative to functionally based systems will have the greatest impact on the localities in the urban system. Currently, cities and towns are responsible for construction of almost all roadways within their jurisdictional limits, including minor and principal arterials. If the State were to base funding allocations on the functional classification system, the local system in cities and towns would contain only those roads functionally classified as locals and collectors. Thus, the new local system would contain far fewer lane miles of road, and the remaining local roads are those that are less expensive to improve.

Hold Harmless Provision Would Reduce Equity of System

When adjustments to allocation formulas have been enacted in the past, an attempt has been made to ensure all jurisdictions were “held harmless.” In other words, enough additional funding has been added so that no locality received less money. However, in these instances, the categories of funding and miles in each system did not change. The recommendations included in this

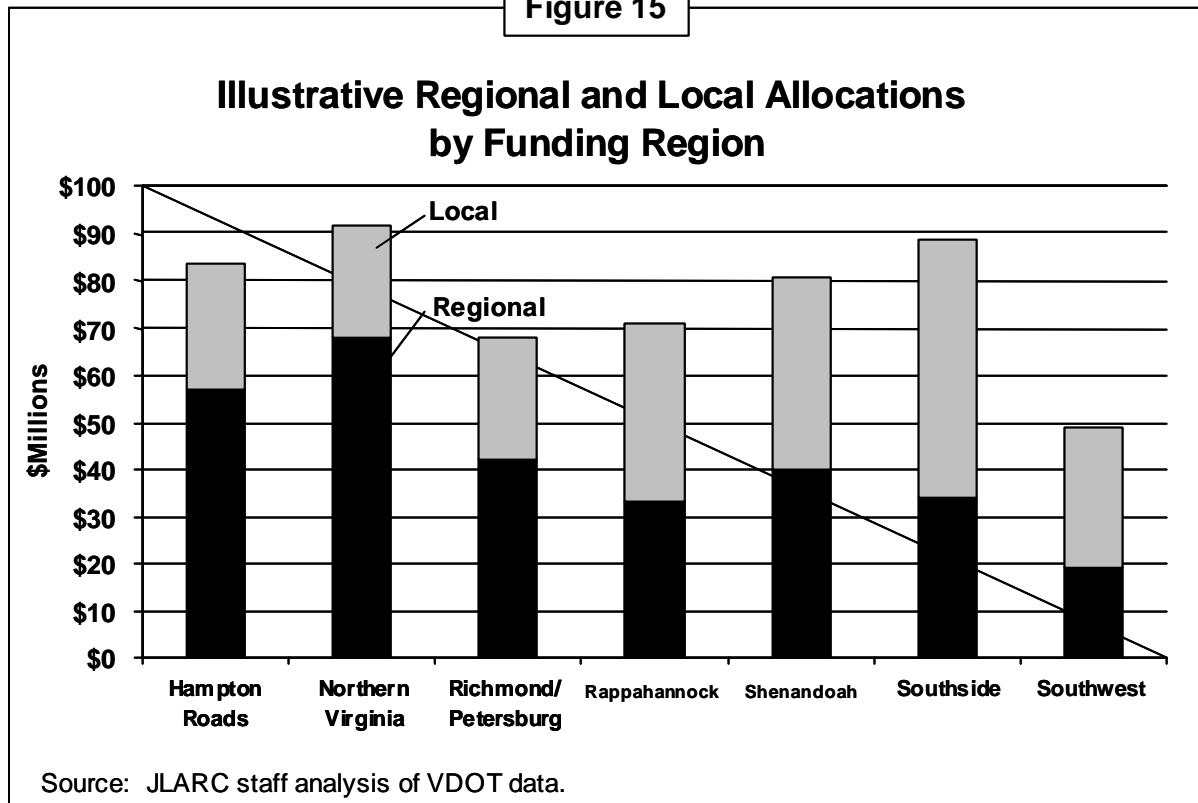
report propose significant changes not just to the formulas, but to the systems themselves and therefore require a reexamination of the applicability of a hold harmless in this instance.

To provide all localities with local allocations equivalent to the allocations they received from the urban and secondary systems in 2001 would require more than \$160 million above the allocation identified as equitable using the needs analysis. This represents close to 20 percent of the funding currently available for formula distribution. Even if enough funding were found to hold all localities harmless, directing all new revenues to the local system would negate the impact of the proposed formula changes, and distribute funds disproportionately to identified need.

Regional System Provides Additional Funding to Urban Areas

Although a greater proportion of the local system funds would go to rural areas than under the existing administrative system, under this proposal regional system funds would go largely to the urban areas. Again, this is based on the nature of the functional system. In urban areas, local roads generally were built to modern standards, and the system is largely complete. Many of the local roads in rural areas are old farm-to-market roads that were paved in place and pose significant safety hazards. In contrast, traffic congestion is low in most rural areas, and the existing minor arterials (which make up the regional system) are sufficient for existing and projected traffic. In urban areas, however, these minor arterials are heavily traveled and often in need of widening. Figure 15

Figure 15



depicts the distribution of local and regional funding among the seven funding regions proposed in this report.

VDOT NEEDS TO ALLOCATE FEDERAL BRIDGE FUNDS USING A PRIORITIZATION SYSTEM

In the needs assessment conducted for this study, JLARC identified a significant number of severely deficient bridges in Virginia and a considerable number of others that will require replacement within ten years. The total cost of replacing these bridges would be substantial. However, even though Virginia has sizeable bridge needs and receives federal funding intended solely for bridge replacement and rehabilitation, VDOT does not allocate funds for bridges. Instead, federal bridge funds flow through the State formula, and are

programmed on bridges only if the Commonwealth Transportation Board (CTB) or locality chooses to use its limited highway allocation for what usually are high-cost bridge projects.

Consequently, there is no mechanism to ensure that bridge funds are spent on the highest priority bridges, and funds often are transferred out of the bridge program to address other highway system needs. This will result in Virginia losing a portion of its federal bridge funding in FY 2002. To address these deficiencies in the existing distribution system, federal bridge funding should be reserved for bridge projects, and should be allocated to the most deficient bridges using a prioritization system.

JLARC Identified Substantial Bridge Deficiencies

As part of its analysis of overall highway deficiencies, JLARC staff evaluated the condition of Virginia's bridges to identify all structures in need of replacement. Bridges with minor deficiencies were excluded from this analysis because they were assumed to be addressed through VDOT's maintenance program. Because bridge needs are not evaluated by HERS, JLARC staff undertook an independent analysis of bridges. FHWA assesses bridge conditions as part of its biennial report on the conditions and performance of the nation's highways, so a model on which to base the analysis was available.

Federal standards were used to determine which bridges in Virginia require replacement, and to estimate the cost of replacing each of these bridges. The basis of the federal bridge assessment is a sufficiency rating system, used as part of the national bridge inspection program. Bridge sufficiency ratings are

calculated on a scale of 0 to 100, using a formula that addresses structural adequacy, functionality, serviceability, and the essentiality of the structure for public use. Under federal law, if a bridge has a rating of 50 or less, it is eligible for replacement.

1,340 Bridges Need Replacement. Using these criteria, JLARC staff identified a total of 1,340 bridges in Virginia that have deteriorated to the extent that they are eligible for replacement using federal funds. This represents about 10 percent of the total inventory. An additional 1,319 bridges were identified as requiring replacement in the next ten years based on their age. The age of a structure is a significant component because the structural and functional life of a bridge is limited by the life of its concrete and steel elements. Under federal guidelines the maximum life expectancy of a bridge is 75 years. According to the Assistant State Bridge Engineer, structures older than 70 years of age cannot be cost effectively repaired or maintained and should be scheduled for replacement.

Severely Deficient Bridges Not Scheduled for Replacement. Table 13 lists some of the bridges in the Commonwealth with sufficiency ratings below 10 on a scale of zero to 100. This table does not contain all bridges rated below 10, but is provided to illustrate the range and seriousness of deficiencies. Most of these bridges with extremely low ratings carry high volumes of daily traffic. Many of these bridges have had recent repair work done. For example, the Huguenot Bridge in the Richmond area had what VDOT defines as major rehabilitative work done in 2000. This work is being done in lieu of a needed replacement because

Table 13 Examples of Severely Deficient Bridges				
Bridge	Location	Rating*	Average Daily Traffic	Year Built
E. Hawthorne Street over C&O Railroad	Danville	0.0	3,337	1900
Route 58 over North Mayo River	Henry	0.0	6,521	1955
Washington Blvd over Columbia Pike	Arlington	2.0	67,000	1944
Huguenot Road over James River	Henrico	3.3	29,832	1949
Fall Hill Avenue Extension over Old Rappahannock Canal	Fredericksburg	6.4	5,165	1950
*Key: 81-100 – Bridge is in acceptable condition. 51-80 -- Bridge eligible for federal rehabilitation funds. 50 and below – Bridge eligible for federal replacement funds. Source: JLARC staff analysis of VDOT Bridge Division data.				

funding is not available. Given that these bridges will have to be replaced, spending funds to rehabilitate them may not be an efficient use of resources.

Cost of Meeting Ten Year Bridge Needs Estimated at \$2.21 Billion.

The costs of replacing deficient bridges were estimated using the formula developed by FHWA to determine its annual bridge program apportionments. In JLARC staff's analysis, the square footage of a deficient bridge is multiplied by the actual average per square foot cost of bridge replacements undertaken in Virginia over the past three years. To ensure that the estimates reflect the full cost of bridge projects, JLARC staff used a federal formula to adjust the cost of

the replacement to account for the non-bridge components of the project, and applied an additional factor to adjust costs to reflect the average increase in the square footage of a bridge when it is replaced. Because of many environmental, safety, and navigational requirements implemented in recent decades, replacement bridges generally are far larger than the original structures. This additive ensures the costs associated with longer and/or wider bridges are captured.

Using this methodology, JLARC staff identified \$1.73 billion in existing bridge needs and an additional \$481 million of bridge needs forecast in the next 10 years. Table 14 depicts the distribution of these bridge needs by the seven proposed JLARC funding regions.

Table 14 Ten-Year Bridge Needs by Proposed Funding Region						
	Deficient Bridges	Cost Current Bridge Needs	Future Deficient Bridges	Cost Future Needs	Total Deficient Bridges	Total Cost Bridge Needs
Northern Virginia	29	\$64,881,623	57	\$22,747,761	86	\$87,629,385
Richmond/Petersburg	103	395,746,583	44	25,267,460	147	421,014,043
Hampton Roads	54	231,274,841	18	12,944,201	72	244,219,041
Shenandoah	325	301,207,480	436	161,978,441	761	463,185,921
Rappahannock	186	324,884,799	161	51,847,445	347	376,732, 244
Southside	356	254,703,032	333	121,114,452	689	375,817,484
Southwest	287	158,410,108	270	84,862,203	557	243,272,311
Total	1,340	\$1,731,108,466	1,319	\$480,761,962	2,659	\$2,211,870,428
Source: JLARC staff analysis of VDOT bridge inventory data.						

Cost of Meeting 20-Year Bridge Needs Estimated at \$2.65 Billion.

JLARC staff also evaluated bridge needs over a 20-year period. Because the estimate of projected future bridge needs is based only on the age of the bridges, increasing the analysis period to 20 years adds only the cost of replacing bridges built between 1935 and 1945. It does not take into consideration needs resulting from traffic growth or other types of deficiencies. Using this methodology, existing and projected future bridge replacement needs over 20 years total \$2.65 billion, an additional \$434 million of potential needs over the ten-year estimate.

VDOT Allocates No Funding Specifically for Bridges

Even though a large proportion of Virginia's bridges are considered deficient according to nationally recognized standards, Virginia does not have a State fund reserved for bridges, nor does it program federal bridge funds to areas based on their bridge needs. Instead, the substantial federal bridge replacement and rehabilitation funds Virginia receives each year flow through the overall State highway allocation formula. As a result, which bridges are replaced is not determined by assessing which bridges are most deficient on a statewide basis.

Further, because bridge funds are co-mingled with highway funds, there is no guarantee that bridge replacements are undertaken at all. Currently, bridge projects are undertaken only if an area chooses to program its primary, secondary or urban funds for bridge projects. Given the higher cost of bridges, this provides a disincentive to allocate limited funds to bridge projects. As a result, VDOT often transfers federal bridge funds to the surface transportation program and allocates them to highway projects instead.

VDOT's Lack of Attention to Bridges Will Lead to Federal Penalties

The federal government considers improving the condition of the nation's bridges to be so critical that 13.5 percent of federal highway apportionments are for bridge improvements. The FHWA estimates that Virginia will receive an average of more than \$94 million per year from the federal highway bridge replacement and rehabilitation program (HBRR) for federal fiscal years FY 1998-2003.

The rules governing the distribution and use of these federal funds, enacted in 1998, are further evidence of the priority placed on improving the condition of the nation's bridges. The bridge program is the one category of federal highway funding distributed in direct proportion to identified need. The formula used to apportion the HBRR funds is calculated by determining the cost of repairing all deficient bridges in each state, and funds are distributed in proportion to each state's proportion of the total improvement costs.

Under federal law, states are allowed to transfer funds from most highway programs to other programs. These provisions were included in recognition of states' differing priorities and because funds in most programs are not apportioned in direct relation to need. However, in recognition of the criticality of bridge improvements and the needs-based focus of the HBRR apportionment formula, federal law penalizes a state if it transfers its bridge funds to another program. For example, if a state transferred a portion of its FY 2000 HBRR apportionment, its 2001 apportionment would be reduced. As a second disincentive, any state that transfers bridge funds is ineligible for funding the following year from the federal bridge discretionary program. This is a \$75

million per year grant program for work on specific bridges. Finally, the portion of bridge funds reserved for “off-system bridges” (those on local roads) may not be transferred under any circumstances.

In contrast to the federal emphasis on bridges, VDOT has chosen to prioritize road construction over bridge improvements. VDOT has transferred almost \$289 million of HBRR funds away from bridges and used them instead for road projects over the past decade. The department has continued to transfer funds even since the penalty provisions were enacted. Earlier this year, VDOT transferred \$110 million of bridge funding to the surface transportation program. As a result, Virginia will be penalized, and its FY 2002 bridge apportionment will be reduced. Although it is not possible to calculate the exact amount of the reduction pending resolution of the federal budget process, FHWA staff estimated that based on FY 2001 funding levels, Virginia’s FY 2002 HBRR apportionment will be reduced by \$12.7 million. Because of the complexities of the federal apportionment process, including calculation of the minimum guarantee program, it is not clear if Virginia will gain any of these funds in other apportionments. It is clear that Virginia will not be eligible for bridge discretionary funds. In FY 2001, Virginia received \$4.4 million from this program for the 14th Street Bridge into Washington.

High Cost of Bridge Work Deters VDOT and Localities from Spending Limited Allocations for Bridge Replacements

One of the principal reasons that bridge funds often are not used on bridges but are transferred to highway projects relates to the comparative costs of these two types of projects. By its very nature, bridge work is far more

expensive than other road construction. Similarly, because bridges are more expensive and local allocations are limited, localities often are reluctant to direct their limited funds to bridge projects.

Cost of Bridge Work Far Exceeds Cost of Highway Construction.

Because of the type of work involved in bridge construction, these projects tend to be far more expensive than highway construction. The difference in cost between highway and bridge costs is demonstrated by a comparative cost analysis of bridge and highway projects contemplated during the last six years. The average cost of the 370 bridge projects completed by VDOT between 1995 and 2000 was about \$1.5 million. The average length of these bridges was only 283 feet, or about 1/20th of a mile. An urban minor arterial 20 times that length, or a local road 60 times that length, could be constructed for the same amount.

Secondary and Urban Allocations Often Not Sufficient to Replace a Single Bridge. The combined impact of the high cost of bridge work and VDOT's reliance on the highway formula (which was designed to reflect overall highway construction needs, not bridge needs) to distribute federal bridge funds, means that localities often do not choose to spend limited funding on bridge projects. This problem is exacerbated by the fact that although a locality could choose to improve a highway one mile at a time, a bridge replacement cannot be extended over a number of years. Under the existing system, secondary and urban allocations often are inadequate to fund even a single bridge.

In response to JLARC staff's request for comments from local governments, several localities stated that one of the biggest problems with the

current funding structure is that they do not receive adequate funds to pay for bridge replacements. The two examples provided below illustrate how the current allocation formulas provide a strong disincentive to maintaining the Commonwealth's bridges.

Several years ago, the town of Front Royal de-annexed land specifically because it could not afford to repair two bridges with the funding available for construction from its urban system allocation. One of these bridges, the North Fork Shenandoah River Bridge on U.S. Route 340, now is scheduled for improvement at a cost of \$15 million, funded from the Staunton district's primary allocation. Front Royal receives approximately \$1 million per year for construction funding. As the town manager stated, "you can quickly see that a town like Front Royal could not afford to use its entire urban allocation for fifteen years just to improve a bridge less than 0.2 miles long."

A similar, still unresolved example was provided by Richmond County. A bridge crossing Cat Point Creek recently had its weight limit reduced because of deteriorated conditions, thus preventing fire trucks from using this bridge, which is the most direct link to the northern portion of the county. As county staff stated:

The governing body of the county supports the immediate replacement of this bridge – VDOT concurs – the public cannot understand why the bridge has not been replaced. The reason is simple! The current funding mechanism requires money to come from the local secondary road budget...The preliminary estimates for the bridge and approaches is almost \$4.4 million. The Richmond County total annual secondary road budget is approximately \$650,000. Seven years of the entire Richmond County budget for secondary roads would be required to build the

bridge – what happens to the other secondary requirements during this period?

Further evidence of this problem was provided by VDOT staff who develop the six-year program. When interviewed as part of this study, staff stated that year after year, the only federal funds VDOT has difficulty spending are what are called “off-system” bridge funds. Off-system bridges are those on roads functionally classified as local or rural minor collectors. Because counties and cities try to maximize the impact of their expenditures by constructing as many projects as possible, VDOT has a difficult time convincing localities to spend their entire allocations on costly bridges.

Bridge Needs Are Not Distributed Across the State in the Same Way as Highway Needs

Because bridge needs are associated more with the age of a structure and safety considerations than with congestion, bridge needs are not distributed across the State in the same manner as are other highway needs. For example, the two most urbanized regions of the State have the fewest bridge needs. There are a number of reasons for this differential. First, because the urbanized areas have experienced continued development, old structures had to be replaced to accommodate increasing traffic. Therefore, there are far fewer bridges built prior to 1940 in these areas. In addition, because these regions have the majority of the State’s transportation needs, they receive substantial allocations and thus have more funding to undertake high cost bridge projects. In contrast, more rural areas of the State have a larger number of old bridges and have much lower overall allocations. Table 15 illustrates the difference between

Table 15 Comparison of the Percentage of Bridge Needs to the Percentage of Overall Highway Needs by Proposed Funding Region			
District	Percent Total Highway Needs	Percent Total Bridge Needs	Ratio Bridge Needs To Highway Needs
Northern Virginia	23.96%	3.96%	0.17
Hampton Roads	21.14%	11.04%	0.52
Shenandoah	15.07%	20.94%	1.39
Richmond	13.16%	19.03%	1.45
Southside	11.17%	16.99%	1.52
Rappahannock	10.18%	17.03%	1.67
Southwest	5.32%	11.00%	2.07
Total	100.00%	100.00%	
Source: JLARC staff analysis of needs assessment data.			

the proportions of bridge needs and overall highway needs in each of the seven proposed JLARC funding regions.

Bridge Fund Should Be Created. If VDOT were to reserve the federal bridge funds instead of combining them with State funds and allocating them according to the State highway formulas, sufficient emphasis could be placed on replacing current bridge assets. Under such a program, federal funds would provide the majority of funding needed to finance bridge replacements. Localities would not be faced with spending multiple years worth of allocations to replace a single structure. Federal funds require a 20 percent non-federal match. This 20 percent match should come from the locality's or region's State funding.

Methodology Exists to Prioritize Bridge Needs. VDOT maintains a continuously updated database of the condition of each bridge in the Commonwealth. Under federal law, every bridge is inspected and rated at least once every two years using federally mandated criteria, and bridges with identified deficiencies are inspected even more frequently. The data collected for this National Bridge Inventory have long been used by U.S. Department of Transportation to assess bridge needs, and form the basis of the HBRR apportionment formula.

Because Virginia collects comprehensive data on the condition of its bridges, no additional data collection would be required to develop a system to identify and prioritize bridge needs based on the severity of deficiencies. Using this existing bridge inspection data, Virginia could rank its bridge needs and direct federal bridge funds to the most critical deficiencies either on a statewide basis, among systems of roadways, or among regions of the State.

Creation of Bridge Fund Would Enable Prioritization of Bridges. If a prioritization system were developed, VDOT could use the results of the analysis as the basis of HBRR allocations each year. The prioritization system could be implemented at a number of levels. At the simplest level, a system based entirely on criticality of need could be implemented, whereby the CTB would allocate funds on a statewide basis to those bridges with the lowest sufficiency ratings in any given year.

Alternatively, if there were an interest in continuing to distribute the funds among the regions of the State on an annual basis, a formula could be developed to

allocate the federal Highway Bridge Replacement and Rehabilitation Funds to the seven proposed JLARC funding regions in proportion to their share of the total existing bridge deficiencies. The CTB could then program the funds within regions based on a prioritization system in which the bridges with the lowest sufficiency ratings would be replaced first. Similarly, bridge funds could be allocated by roadway system, with the funds being distributed among the proposed statewide, regional, and local systems based on each system's relative share of needs.

Benefits of a Separate Bridge Fund. Each of these alternatives would present a number of benefits over Virginia's existing system for distributing federal bridge funds. First, because the funds would be allocated exclusively for bridges, there would be no need to transfer funds to other programs, and Virginia would not be faced with losing money under federal penalty provisions. Second, allocating funds in this manner would ensure that Virginia programmed sufficient funds to off-system bridge projects. Third, changing the method of distribution would provide a mechanism to focus on preserving assets and distribute funds in proportion to need. As the analysis discussed above illustrates, there is no direct correlation between overall highway needs and bridge needs. Using one formula to allocate funds for both types of projects has meant that areas of the State with a large proportion of bridge needs but a small proportion of the State's highway needs do not have sufficient allocations to meet their bridge needs.

Recommendation (13). The General Assembly may wish to consider amending Article 1.1 of Title 33 of the *Code of Virginia* to require VDOT to place federal highway bridge replacement and rehabilitation funds into a separate State bridge fund and allocate these funds using a prioritization system based on the severity of each bridge's deficiency.

IV. Adequacy of Funding

Along with the distributional aspects of construction funding, this review also examined whether there is adequate funding to construct project priorities that have been identified. Based on a review of projected revenue and the estimated cost of project priorities identified both by the General Assembly and at the regional level, there will not be sufficient funds over the next ten years to pay for them.

The General Assembly's frustration with the lack of project funding and VDOT's perceived unresponsiveness to the legislature led to the General Assembly's recent decision to assume a more active role in the process for selecting and funding construction projects. While the General Assembly's increased involvement in the process has had some important benefits in the near term, the General Assembly may wish to re-examine its long-term role in the process.

ESTIMATED FUTURE FUNDING APPEARS TO BE INADEQUATE FOR ESTIMATED NEEDS OR IDENTIFIED PROJECTS

In addition to undertaking an assessment of all highway construction needs to determine how to allocate and distribute highway construction funds, this study compared the costs of identified priority projects with construction funding anticipated to be available. This analysis was conducted based on the assumption that there will always be a gap between identified needs and available funding. Although a full needs assessment is helpful in determining the equitable distribution of funds, it does not necessarily reflect a realistic funding

level. In order to provide the General Assembly with information to assess the the level of construction funding in relation to future allocations, JLARC staff compared revenues anticipated to be available over the next ten to 20 years with the costs of projects that have already been identified for construction. Staff analysis indicated that the VTA projects and all other interstate and primary projects in the current Virginia Transportation Development Plan (six-year plan) cannot be funded over the next ten years and can only be funded over 20 years if the cost of the projects does not increase significantly.

VDOT Will Have About \$26 Billion Available for Construction Over the Next 20 Years

To assess the adequacy of funds available for highway projects identified as priorities by the General Assembly, a long-range forecast of transportation revenues and expenditure requirements was developed. The long-range projection developed by VDOT was used as the basis for the analysis of revenue availability. Under federal law, Virginia's three major metropolitan planning organizations (MPOs) are required to create financially constrained 20-year plans. To assist the regions in the development of these plans, VDOT produces an estimate of revenues anticipated to be available for highway construction. The most recent VDOT long-range forecast covers the fiscal years 2001 through 2025.

The JLARC staff 20-year revenue forecast mirrors, to a large extent, the VDOT forecast. However, because of concerns about some of the expenditure assumptions included in VDOT's revenue forecast, JLARC staff adjusted the VDOT forecast to better reflect historic trends. On the revenue side,

JLARC staff project an anticipated \$75 billion in total transportation revenues between 2002 and 2021. The VDOT estimate is just four percent lower, at \$72 billion. The forecasts are based on information available almost a year ago, and VDOT had not updated their forecast to reflect more recent conservative assumptions about short-term economic growth.

On the expenditure side, the JLARC and VDOT assumptions differed more markedly. For example, JLARC staff did not use VDOT's assumptions about maintenance costs. VDOT's future expenditure assumptions are based on linear trend analysis of forecast expenditures used in the development of the six-year plan. VDOT's FY 2001-2006 program included the assumption that maintenance would be flat for the final five years of the program. Basing trend line analysis on flat allocations results in an estimate that maintenance expenditures increase about one-third of one percent annually over 20 years.

However, VDOT's actual maintenance budget has increased an average of 3.2 percent annually over the last ten years. Without any evidence to suggest that the rate of growth of maintenance expenditures will decline substantially, JLARC staff adjusted the VDOT forecast to reflect 3.2 percent annual growth in maintenance costs. As a result of the differing assumptions about maintenance costs, JLARC staff's forecast projects that maintenance expenditures may be \$6 billion more than VDOT's forecast. The different assumptions regarding maintenance costs caused the greatest proportion of variation between the two forecasts. Other assumptions that differed in the

forecasts are detailed in Appendix B; none resulted in differences nearly as substantial. Table 16 presents a summary of the two forecasts.

The net result is that JLARC staff's forecast estimates \$26.4 billion will be available for construction allocations to the interstate, primary, secondary, and

Table 16 Long-Range Forecast Revenues and Allocations FY 2002-2021			
	VDOT Estimate	JLARC Staff Estimate	Difference
10 Year Estimate			
Total Revenues	\$32,876,057,500	\$33,136,825,685	\$260,768,185
Expenditures:			
Maintenance	11,119,934,000	12,383,776,884	1,263,842,884
Other Transportation Modes	2,277,551,100	2,311,270,100	33,719,000
Administration, construction management, and other activities	6,044,505,141	6,259,861,267	215,356,126
Highway systems construction	13,434,067,259	12,181,917,434	(1,252,149,825)
Total Expenditures	32,876,057,500	33,136,825,685	260,768,185
20 Year Estimate			
Total Revenues	72,416,829,500	75,266,944,492	2,850,114,992
Expenditures:			
Maintenance	23,310,266,900	29,286,250,187	5,975,983,287
Other Transportation Modes	5,388,219,100	5,863,326,600	475,107,500
Administration, construction management, and other activities	13,085,609,389	13,725,539,358	639,929,969
Highway systems construction	30,632,734,111	26,391,828,347	(4,240,905,764)
Total Expenditures	\$72,416,829,500	\$75,266,944,492	\$2,850,114,992
Note: Total maintenance includes city street payments to localities. Other activities includes all other VDOT allocations including safety, planning, toll facilities, etc. Highway systems construction refers to funding available for the interstate, primary, secondary and urban systems, net FRANs proceeds, and revenues deposited in the PTF.			
Source: JLARC staff analysis of VDOT and DMV revenue forecasts, VDOT expenditure forecasts and historical trends of VDOT revenues and expenditures.			

urban systems, including estimated Priority Trust Fund (PTF) revenues and net FRANs proceeds, over the 20-year period. The VDOT forecast projects 16 percent more available for construction allocations, or \$30.6 billion. This is less than 35 percent of total revenues after funds are allocated to the other modes, maintenance, operations, administration and special programs.

Completing VTA Projects Will Require Majority of Projected Revenues for 20 Years

Although the VTA provided a significant infusion of general funds to the transportation program, and directed some additional revenue sources to transportation beginning in 2003, these funds are not sufficient to finance the full costs of the VTA projects. In addition, although the VTA projects are, at the General Assembly's direction, VDOT's highest priority, there are hundreds of other projects already in the six-year plan. It appears that all funding available for interstate and primary system construction (including Priority Transportation Funds) over the next 20 years will be required to complete the projects identified in the VTA and currently in the six-year plan.

VTA Identified Priority Projects but Did Not Provide Sufficient Funding to Complete Them. The VTA established a new Priority Transportation Fund (PTF) and identified 121 projects to be funded from it. The legislation authorized \$1.7 billion in PTF and FRAN expenditures for these specific projects. Yet the total cost of these 121 projects alone is \$12.9 billion in 2001 dollars. Thus, the VTA authorized only 13 percent of the funding needed to complete the projects identified as priorities. To complete these projects VDOT will have to depend largely on other transportation revenues.

\$14.2 Billion Required to Complete Highway Projects Identified in the VTA. Based on VDOT's most recent estimates, the total cost of all highway projects identified in the VTA (including the general fund as well as PTF projects) is expected to be \$17.8 billion. Of this total, \$2 billion was allocated prior to 2001, and an additional \$1.6 billion was allocated to these projects in 2001. Hence, the outstanding cost of the VTA projects in FY 2002 was \$14.2 billion based on current cost projections.

JLARC staff estimate that the funding available for interstate and primary system construction and the PTF between 2002 and 2011 will be \$7.7 billion (after funds are allocated to the secondary and urban systems). Based on this estimate, it appears that there is a \$6.5 billion shortfall of funding to cover VTA project costs. Even if all construction funds were directed to VTA projects for ten years and secondary and urban system allocations to the local jurisdictions were discontinued, the projects identified in the VTA could not be completed by 2012. The revenue available would be \$2 billion less than the amount needed to fund these projects over the next ten years. These calculations include the net revenues from the proposed sale of \$1.2 billion of FRANs and all anticipated revenues to the PTF, including the insurance premium tax revenues.

Over a 20-year period, JLARC staff estimate that \$26.4 billion will be available for allocation to the interstate, primary, secondary and urban systems from all federal and State sources (including PTF revenues) between 2002 and 2021, compared to \$14.2 billion of outstanding VTA costs. However, of that total,

only \$16.2 billion is anticipated to be available after mandatory set-asides and secondary and urban system allocations are made to the localities. Thus, available revenues would be sufficient to fund the estimated \$14.2 billion of remaining VTA project costs, but these projects would require almost 90 percent of funding available for primary and interstate projects until 2022. Table 17 provides a summary of VTA project costs compared to ten and 20-year revenue availability.

Funding Other Six-Year Plan Projects Increases Shortfall Substantially.

If projects in the six-year plan not listed in the VTA are included in this analysis, the funding shortfall is even more substantial. There are hundreds of other projects already under way, some only at the preliminary engineering phase, others under construction. These include such projects as the Chippenham Parkway in the Richmond area, Route 210 in Amherst County, and I-581 in the

Table 17				
Comparison of Estimated VTA Project Costs with Forecast of Available Construction Funds				
Funding Available			Total VTA Project Costs	Revenue Gap or Remaining
10-Year	All Systems Construction Funds:	\$12.2 billion	\$14.2 billion	(\$2.0 billion)
	Funds After Secondary and Urban Allocations:	\$7.7 billion	\$14.2 billion	(\$6.5 billion)
20-Year	All Systems Construction Funds:	\$26.4 billion	\$14.2 billion	\$12.2 billion
	Funds After Secondary and Urban Allocations:	\$16.2 billion	\$14.2 billion	\$2.0 billion
Note: Construction funds does not include special program funding allocated subject to requirements imposed by State and federal law. Costs refer to the amount unfunded as of FY 2002. The cost estimate only takes into account inflation to the extent that VDOT incorporated inflation estimates for work to be done within the next six years. Source: JLARC staff analysis of VDOT project cost estimates and DMV and VDOT revenue forecast data.				

city of Roanoke. In total, the interstate and primary system projects in the six-year plan, excluding all VTA projects (including those receiving general fund allocations), have a total cost of \$3.4 billion. Forty percent of the costs, or \$1.38 billion, had not been allocated through 2001.

Consequently, the combined funding requirement to complete all the VTA projects and the other interstate and primary system projects in the six-year plan is \$15.6 billion. With only \$7.7 billion estimated to be available over ten years for the interstate and primary systems (including PTF funds), there is a funding shortfall of \$7.9 billion to fund these projects by 2012. Even over 20 years, available interstate and primary construction funds exceed project costs by only \$600 million. Virtually all of these funds available over the next 20 years would be required to fund the VTA projects and the interstate and primary projects in the 2001 six-year plan. If urban and secondary funds are also assumed to be available and allocations to localities discontinued, then the VTA projects could be constructed over 20 years based on current cost estimates of these projects. Table 18 shows the revenue estimated to be available and estimated costs to fund the VTA and other projects in the six-year plan.

Project Costs Likely to Increase. Based on the JLARC staff's review of project costs conducted last year, the above analysis may understate substantially the gap in funding. That study concluded that VDOT may have been understating the cost of VTA projects in the six-year plan by as much as 47 percent even with an inflation factor included in the estimates. Moreover, the project cost estimates for those projects currently in the six-year plan include

Table 18 Comparison of Estimated VTA and Six-Year Plan Project Costs with Forecast of Available Construction Funds			
Funding Available		Total VTA Project Costs	Revenue Gap or Remaining
10-Year	All Systems Construction Funds: \$12.2 billion	\$15.6 billion	(\$3.5 billion)
	Funds After Secondary and Urban Allocations: \$7.7 billion	\$15.6 billion	(\$7.9 billion)
20-Year	All Systems Construction Funds: \$26.4 billion	\$15.6 billion	\$10.8 billion
	Funds After Secondary and Urban Allocations: \$16.2 billion	\$15.6 billion	\$0.6 billion
Note: Construction funds does not include special program funding allocated subject to requirements imposed by State and federal law. Costs refer to the amount unfunded as of FY 2002. Projects included are all VTA projects, and all non-VTA interstate and primary system six year plan projects. The cost estimate only takes into account inflation to the extent that VDOT incorporated inflation estimates for work to be done within the next six years. Source: JLARC staff analysis of VDOT project cost estimates and DMV and VDOT revenue forecast data			

inflation only to the extent that VDOT inflated estimates for work to be done within the next six years. The cost estimates do not take into account inflation that is likely to increase the cost of projects built beyond the current six-year plan period. Given the likelihood that the estimated cost of these projects will be substantially higher than the current estimates, the ten-year funding gap is likely to be substantially greater than presented in Table 17. Even over 20 years, there is not likely to be sufficient interstate and primary funding for the VTA projects, along with the other ongoing projects in the six-year plan, if project costs increase substantially.

Gap Between Estimates of Highway Needs and Available Funding Will Be Substantial

Another way to assess funding adequacy is to compare projected revenues to identified transportation needs. As detailed in Chapter III, a

comprehensive assessment of highway deficiencies was conducted as part of this review of transportation funding. The needs assessment captures all objectively identifiable congestion, safety, and geometric needs. It does not attempt to prioritize among the needs, nor does it include more subjectively selected projects or those proposed to serve needs that are not purely transportation-based. The following sections provide estimates of the gap between available funding and identified needs on a ten and 20-year basis.

Ten-Year Needs Exceed Available Funding by at Least \$22.5 Billion.

The needs assessment compiled by JLARC staff contains \$38.2 billion of needs over the next ten years. The total amount available for VDOT's construction program during that period is \$15.8 billion, or \$22.4 billion less than the funding needed. If only those funds anticipated to be available for allocation to the interstate, primary, secondary and urban systems and from the PTF are considered, available funding drops to \$12.2 billion, \$26 billion less than identified needs. Because there is an existing backlog of deficiencies, the ten-year assessment produces a larger annual funding gap than would the use of a longer analysis period. To ensure that the assessment of revenue adequacy produced an accurate annualized revenue requirement, JLARC staff also compared needs and revenues over a 20-year timeframe.

Twenty-Year Needs Exceed Funding by \$24 Billion. JLARC staff also produced a 20-year estimate of needs, which totaled \$58.3 billion, about 50 percent more than ten-year needs. The total amount available for VDOT's construction program during that period is projected to be \$34.3 billion, \$24

billion less than the funding needed. If only funding anticipated to be available for allocation to the interstate, primary, secondary, and urban systems and from the PTF are considered, available funds drop to \$26.4 billion, \$32 billion less than identified needs.

Thus, over 20 years, funding available for allocation through the State formula appears to be at least \$1.6 billion less per year than identified needs. Over a ten-year period, the gap would be \$2.6 billion per year. The annual gap for the ten-year period is far greater because the ten-year needs assessment includes the existing backlog of needs. Using a 20-year analysis period allows the backlog of deficiencies to be funded over a longer period of time.

\$13.1 Billion Additional Capital Funding Required to Complete Projects in the Northern Virginia 2020 Plan

Another indication of the potential gap in funding is the Northern Virginia 2020 plan. The 2020 Plan was released in December 1999 and is the regional roadmap for priority transportation improvements needed in that region within the next 20 years. The plan was developed under the direction of the Northern Virginia Transportation Coordinating Council (TCC). The TCC is an advisory group of local elected officials that serves as the Northern Virginia caucus on recommending regional transportation priorities and funding allocations. There are 27 members of the TTC, 13 from the Northern Virginia jurisdictions and ten members from the General Assembly. In total, the plan identified more than \$13 billion in unfunded highway and transit needs through 2020.

NOVA 2020 Plan Is Not a Full Needs Assessment. The development of the 2020 plan was a multi-year process. Staff work for the plan was conducted by VDOT Northern Virginia district staff. Staff produced a preliminary list of improvements in 1998 based on projected regional demographic changes over the next 20 years and a comparison of transportation network capacity to forecast demand. This list was reviewed during an initial round of public outreach hearings in the summer of 1998. A draft report was circulated for review in January 1999, edited, and subjected to another round of public hearings in July 1999 before the final plan was released in December of that year.

The 2020 plan was not intended to identify all needed improvements to the transportation system. Staff involved in the process described the plan as a cross between a full needs assessment and a financially constrained plan. The goal of the 2020 plan was to identify the key transportation priorities in the region. As such, improvements to many identified deficiencies were excluded from the plan if they were not the highest priorities for the region.

\$6.45 Billion Additional Construction Funding Required to Complete Highway Projects in the 2020 Plan. Based on revenue forecasts completed as part of the 2020 Plan, the total unfunded cost of the highway improvements identified in the 2020 Plan was estimated to be about \$6.45 billion in 1999 dollars. The region's constrained long-range plan – which covers the years 2001-2025 – projects that revenues available for allocation to highway projects will total \$6.59 billion in 2000 dollars. Thus, the unfunded portion of the Northern

Virginia highway projects identified as priorities for the next 20 years almost equals forecast revenues over 25 years.

\$6.56 Billion Capital Shortfall to Complete Transit Projects Identified in the Northern Virginia 2020 Plan. The 2020 plan is a multimodal assessment of regional transportation needs and, as such, contains an analysis of transit needs. The unfunded portion of transit needs identified in the 2020 plan is more than the highway shortfall. The 2020 plan identifies a total of \$6.56 billion in unmet transit capital needs between 2001 and 2020. In contrast, the constrained long-range plan assumes \$3.02 billion will be available for transit capital projects between 2001 and 2025. Thus, unmet needs are more than double the projected transit capital funds in Northern Virginia over the next 25 years. In addition to the capital costs, if funding were made available and all the proposed transit system improvements were implemented, transit operating and maintenance expenditures also would increase by \$138 million per year. This would be in addition to the \$161 million per year through 2025 currently programmed for transit operating costs.

Limited Funding Available for New Transit Systems or System Expansions

In addition to the Northern Virginia transit needs identified in the 2020 plan, there are transit needs in other areas of the State as well. The last comprehensive assessment of transit needs, conducted in 1997 at the request of the Commission on the Future of Transportation, presented three estimates of need based on the use of a range of assumptions about system growth. Using the moderate estimate of needs, the Commission identified what is the equivalent

of \$2.58 billion in transit capital needs in 2001 dollars, excluding those in Northern Virginia.

State funding for transit capital is anticipated to be considerably less. Under current law, the Department of Rail and Public Transportation (DRPT) allocates for capital projects 25 percent of the 14.7 percent share of TTF revenues that are allocated to transit. The types of projects financed through this program generally are not new systems or major system expansions. Instead, much of the capital funding is used for routine capital expenses such as replacing bus stock and improving existing facilities. Nonetheless, available funding is inadequate to finance even these limited activities.

Under the provisions of §58.1-638 of the *Code of Virginia*, up to 95 percent of the non-federal share of capital projects is eligible for State funding. However, because annual project requests exceed available funding, the full allowable amount has not been provided in any year over the last decade. In FY 2002, DRPT was able to fund only 43 percent of the costs of proposed projects.

In total, JLARC's 20-year revenue forecast estimates that \$3.36 billion will be available to DRPT from State TTF contributions between 2001 and 2025. The total portion of that funding available for all transit capital projects on a statewide basis is estimated to be \$840 million. Given that less than \$1 billion of State support is anticipated to be available for transit capital projects across the State over the next 20 years, and a substantial portion of that will be directed to Northern Virginia, few if any of transit system expansion needs identified by the 1997 study could be implemented using existing State funding sources.

VIRGINIA TRANSPORTATION ACT NEEDS REVISION

In 2000 the General Assembly enacted the Virginia Transportation Act, which gave the legislature a substantially greater role in the process of funding road construction projects. While the Act served important purposes, it also has complicated the funding process by reducing VDOT's programming flexibility and minimizing the CTB's traditional authority to prioritize and select projects for construction. Another means by which the General Assembly can have an increased role in the process is through the appointment of the at-large members to the CTB.

Virginia Transportation Act Achieved Important Goals

The Virginia Transportation Act served important purposes. One of the concerns that gave rise to the need for the Act was the serious cash flow shortage being experienced by VDOT. VDOT's lack of cash caused it to delay numerous projects in the six-year program. The VTA alleviated the near-term cash shortage by providing approximately \$500 million in general fund dollars for transportation construction so that the development of these delayed projects could resume.

Another purpose served by the VTA was to give the CTB the statutory authority to issue federal revenue anticipation notes (FRANs). FRANs are bonds issued to raise funds for highway construction that are to be repaid from future federal highway reimbursements. Issuance of the bonds serves to accelerate

receipt of federal construction funds that the State would not otherwise receive for several years.

The VTA also established another dedicated revenue source for transportation. The Act provided that one-third of the revenue collected from the insurance license tax would be allocated to the Priority Transportation Fund beginning in FY 2003. This will amount to approximately \$100 million annually in additional transportation funds over the next several years.

Virginia Transportation Act Has Complicated the Construction Funding Process

Other aspects of the VTA have complicated the funding process.

Most transportation officials, both at VDOT and at the local level, all Commonwealth Transportation Board members that provided comments, as well as many local government officials that have shared comments either through panel discussions or in writing, have expressed concern with aspects of the VTA. Major areas of concern expressed by local and State transportation officials and CTB members appear to be that the VTA complicates and unnecessarily restricts the allocation process and that the VTA establishes a precedent for the use of general funds to pay for transportation projects. The VTA also establishes the Priority Transportation Fund, which may not be necessary.

The VTA Confuses Authority for Funding Decisions at the Project Level. VDOT officials and CTB members believe that a primary difficulty with the General Assembly's involvement in the project selection process is that it creates

two separate entities with the same role in selecting project priorities. The powers granted to the CTB by State statute give the CTB the authority to make funding decisions about projects and to prioritize projects for funding. Based on this statutory authority, the CTB has assumed responsibility for the selection of projects and the prioritization of those projects through the development of the six-year plan. However, with the VTA, the General Assembly has assumed this role as well, which is likely to lead to further confusion and conflict in programming projects for construction. One member of the CTB stated that with the VTA, the authority of VDOT and the CTB has been usurped, but responsibility for developing a construction program is still with the CTB.

Establishment of Separate Priority Fund Complicates Funding Process and Reduces VDOT's Flexibility. The additional revenues provided by the VTA will only pay a small portion of the costs associated with the projects listed as priority projects by the General Assembly. Therefore, the vast majority of the funding for the projects will come from the Transportation Trust Fund. This complicates the role of the CTB and VDOT in funding projects not listed in the Priority Transportation Fund. With the funds that are required to construct the legislative priorities, there likely be little money left to fund other projects that need to be developed. Therefore, projects not listed in the VTA are likely to be delayed as available funds are allocated to VTA projects. The Secretary of Transportation told JLARC staff that the effect of the VTA was to freeze the program at its current level and preclude the funding of new projects not in the VTA or six-year plan as of 2000.

In addition, the constraints imposed by the VTA complicate the six-year plan development process. With the extensive federal requirements and unanticipated changes that affect the progress and development of projects, VDOT needs to have maximum flexibility in programming projects to ensure that the funds are fully utilized in an efficient manner. The constraints imposed by the VTA reduce VDOT's flexibility and make it considerably more difficult to efficiently allocate funds to projects. Under the VTA, certain funds can only be allocated to projects designated as Priority Transportation Fund projects. Moreover, insufficient revenues were allocated to complete these projects. This has constrained VDOT in trying to fund projects that need money but are not designated as PTF projects and, therefore, are not eligible for available PTF funds.

VTA Establishes a Precedent for Reliance on General Funds. Another concern with the VTA expressed by local government officials is that it establishes a precedent for reliance on general funds for highway projects. Transportation traditionally has been funded through dedicated fund sources to ensure the stability and reliability of funding over time. This steady and reliable funding is necessary because of the long-term nature of construction projects and the need to plan for the development of projects that may not be constructed for years to come. The concern expressed by local officials is that basing future transportation programs on general fund money is tenuous and less reliable given the potential for substantial changes in the economic climate.

Priority Transportation Fund May Have Limited Value. The Priority Transportation Fund appears to have been established primarily in response to the perception that VDOT was not responsive to transportation needs and changing priorities, and that certain projects were not receiving adequate funding. Most of the projects designated as PTF projects were projects on interstate and other arterials that had already been identified as needed projects and were in the six-year plan. The General Assembly's need to create a priority trust fund appears to have been largely the result of the lack of funding for these projects that legislators considered priorities. Establishment of a separate fund for these projects without the allocation of funds necessary to pay for them may limit the PTF's value. A more effective means to address the General Assembly's frustration would be to adopt the system proposed in this study and allocate funds in proportion to needs. This would result in more funds allocated for major roads and thus more funds available for the vast majority of the projects designated as PTF projects.

General Assembly Should Have Role in Process Through Appointments to the Commonwealth Transportation Board

While project level involvement by the General Assembly may be problematic, the General Assembly should have an increased role in influencing the funding of highway construction projects. The CTB appears to be an effective body to develop project-level priorities. Therefore, it may be more appropriate for the General Assembly to assume an increased role in the process by giving itself the authority to appoint some members to the CTB.

Under current law, the governor appoints all of the CTB members. Members are appointed from each of the nine VDOT districts. In addition, the governor appoints five at-large members, with two designated as urban at-large and two as rural at-large members. The Secretary of Transportation serves as chair of the CTB, and the Commissioner of VDOT and the Director of the Department of Rail and Public Transportation serve as ex-officio members.

One alternative may be for the General Assembly to appoint the five at-large members to the CTB. The governor would retain the authority to appoint the other members of the Board. While not providing the direct role in project selection established by the VTA, this appointment power would give the General Assembly a greater role in the process while allowing the CTB to serve as the single entity responsible for allocating the construction funds at the project level.

Recommendation (14). The General Assembly may wish to amend §33.1-1 of the *Code of Virginia* to provide for General Assembly appointment of the five at-large Commonwealth Transportation Board members.

Recommendation (15). The General Assembly may wish to consider restoring the Commonwealth Transportation Board's role in project selection by amending the Virginia Transportation Act to remove those provisions that limit the Board's flexibility to program construction revenues made available by the Virginia Transportation Act in accordance with the State allocation formulas.

V. Public Transit in Virginia

Another important aspect of transportation in Virginia is public transit. Public transit serves as an important alternative to automobiles in many circumstances. Transit systems in Virginia are regional or local operations and rely on local government as well as federal and State financial assistance. While transit appears to be growing and has received increased State funding in recent years, the State needs to make organizational changes to further ensure that the full range of transportation solutions is considered to meet growing transportation challenges and that planning is not too narrowly focused on highway solutions.

ROLE OF TRANSIT IN MEETING STATE TRANSPORTATION NEEDS

Although private vehicles provide the means of transportation for most Virginians, public transit plays a significant role in meeting the State's transportation needs. Public transit, which includes bus, van, rail, and ferry services, provides an alternative to the private automobile. Public transit reduces congestion on highways and provides a means of transportation for many Virginians who are not able to or cannot afford to drive a car. Other uses of transit include reducing air pollution, supporting welfare reform, and revitalizing neighborhoods. The effectiveness of serving these purposes and providing these benefits is dependent on multiple factors including land use development, level of congestion, and regional cooperation.

Public Transit Provides Transportation Alternative to Private Vehicles

One of the principal purposes of transit is to reduce congestion on roadways that are heavily traveled, particularly during certain peak periods. Transit is often a more cost-effective means to handle some of the excess travel demand during peak periods in urban areas than increasing the capacity of highways that are otherwise unable to handle the traffic. Moreover, in densely developed urban areas of the State such as Northern Virginia, the construction of additional highway capacity may be prohibitively expensive and not practically feasible. In such instances, transit plays an increasingly important role in meeting the transportation needs of the region as roads become more congested. Total transit ridership in Virginia was nearly 160 million in 2000.

Metrorail in Northern Virginia is a good example of a system that has effectively supplemented roadways in high travel demand corridors. The Metrorail subway system serving Washington D.C., Northern Virginia, and Maryland carries more than 500,000 riders per day, with approximately 200,000 riders per day in Northern Virginia. While the area still has very high congestion levels on the roadways, congestion would be substantially worse without it.

Another important purpose served by transit is to provide a transportation alternative to persons who do not have use of a private automobile. This group includes the elderly, disabled, low-income, and children under the legal driving age. Statistics indicate that there are a substantial number of Virginians in these categories. According to 2000 Census data, more than one million Virginians are aged 60 or older, and 360,000 are aged 75 or older. A recent State study reported that approximately 1.4 million Virginians

have a disability, and 900,000 Virginians live below the poverty level. For many of these persons, public transit is their only means of transportation.

Public Transit Provides Benefits in Addition to Improved Mobility

Public transit also provides other important benefits to the State. In the large urbanized areas -- Northern Virginia, Hampton Roads, and Richmond -- public transit is a necessary component of transportation planning in order to meet federal air quality standards set by the EPA. Because automobile emissions contribute to the poor air quality in urban areas, transit alternatives that reduce vehicle trips reduce vehicle emissions and therefore contribute to improved air quality. Currently, Northern Virginia does not meet air quality standards and is considered to have "nonconformity" status. Hampton Roads and Richmond previously did not meet air quality standards and are considered to have "maintenance" status. These regions are required by law to limit increases in vehicle miles traveled (VMT). Therefore, public transit improvements aimed at reducing VMT have become an integral part of long-range transportation plans in order to comply with the regulations.

Transit provides other benefits to the State as well. Transit has been an important component of welfare reform by providing a means of transportation for those low income persons who have jobs significant distances from their homes. In addition, transit can help revitalize declining neighborhoods through the development of transit stations that serve as hubs for other economic activity.

Several Factors Affect Public Transit's Viability

Factors affecting transit viability include population density, local land use planning, and regional cooperation. Some level of public transit service is needed in most areas of the State to provide transportation for those persons who are unable to drive. However, above this basic level of service, the intensity and effectiveness of transit service is greatly affected by congestion levels, land use characteristics, and local attitudes about transit.

Public transit serves a vital mobility role in densely developed urban corridors. In Northern Virginia, for example, transit service is essential for meeting the transportation needs and maintaining quality of life. Because the area is so densely developed along certain corridors, and there is a high level of traffic congestion, transit ridership is high and extensive transit service is provided.

Public transit service is not as viable in less densely developed suburban areas. Such areas often have fewer sidewalks and wider streets, and thus are less conducive to transit in general. In these low-density areas, it is often difficult for commuters to reach a transit stop without the use of an automobile. Moreover, because population is more dispersed in these areas, transit service is less cost effective due to lower ridership levels for any given route.

The level of land use planning also greatly impacts the viability of transit. Most suburban areas of the Commonwealth were developed after the automobile came into widespread use. Consequently, these communities were designed with little regard for public transportation, and a private vehicle is

required for almost all transportation. In contrast, some urban areas, such as Arlington, have conducted their land use planning based on the development of transit, and therefore have much higher levels of transit ridership.

Finally, the lack of regional cooperation and prioritization of transit in some areas of the State has slowed its development. In both the Hampton Roads and the Richmond areas, the development of regional transit systems have been slowed by regional differences. The development and growth of transit in Northern Virginia has been facilitated by greater regional cooperation.

EXISTING STATE OF TRANSIT SERVICES IN VIRGINIA

In contrast to the highway system, which is developed and administered at the State level, transit in Virginia is highly decentralized with each transit system operated either regionally or locally. Transit operators typically receive some revenues from fees charged, and the remainder of their funds comes from a variety of sources, including federal, State, and local funds. Transit operators contend that the current funding structure as well as the lack of capital funds for transit are impeding public transit's development.

Nature of Transit Operations in Virginia

Currently, there are 39 public transit operators in Virginia. The operations consist of subway and commuter rail services in Northern Virginia, a ferry service in Tidewater, and bus and van services in the remainder of the State. The transit services are all locally or regionally operated, but range in service from a small number of vans that serve less than 500 riders per year to the Washington Metropolitan Area Transit Authority's (WMATA) Metrorail system

that served approximately 72 million riders in FY 2000. Statewide, transit operators generated ridership of about 160 million in FY 2000.

The vast majority of transit operators in the Commonwealth provide bus service. Commuter rail service is offered only in Northern Virginia. There is great variation in the size of transit operations across the State, with the largest operators in Northern Virginia, Hampton Roads, and Richmond. In FY 1998, 85 percent of all transit ridership in the State was generated by three transit operators in these major urban regions: Washington Metropolitan Area Transit Authority (WMATA), Hampton Roads Transit (HRT), and Greater Richmond Transit Commission (GRTC). Approximately 50 percent of all ridership was generated by WMATA's Metrorail service.

There is no State-operated public transit service in Virginia. Public transit services throughout the Commonwealth are operated at the local or regional level. In some instances, transit service is operated through a local government agency. In other instances, transit services are provided by a regional authority, as is the case with GRTC, HRT, WMATA, and several other smaller operators. Other transit operators are independent non-profit companies such as JAUNT, Inc. in the Charlottesville area.

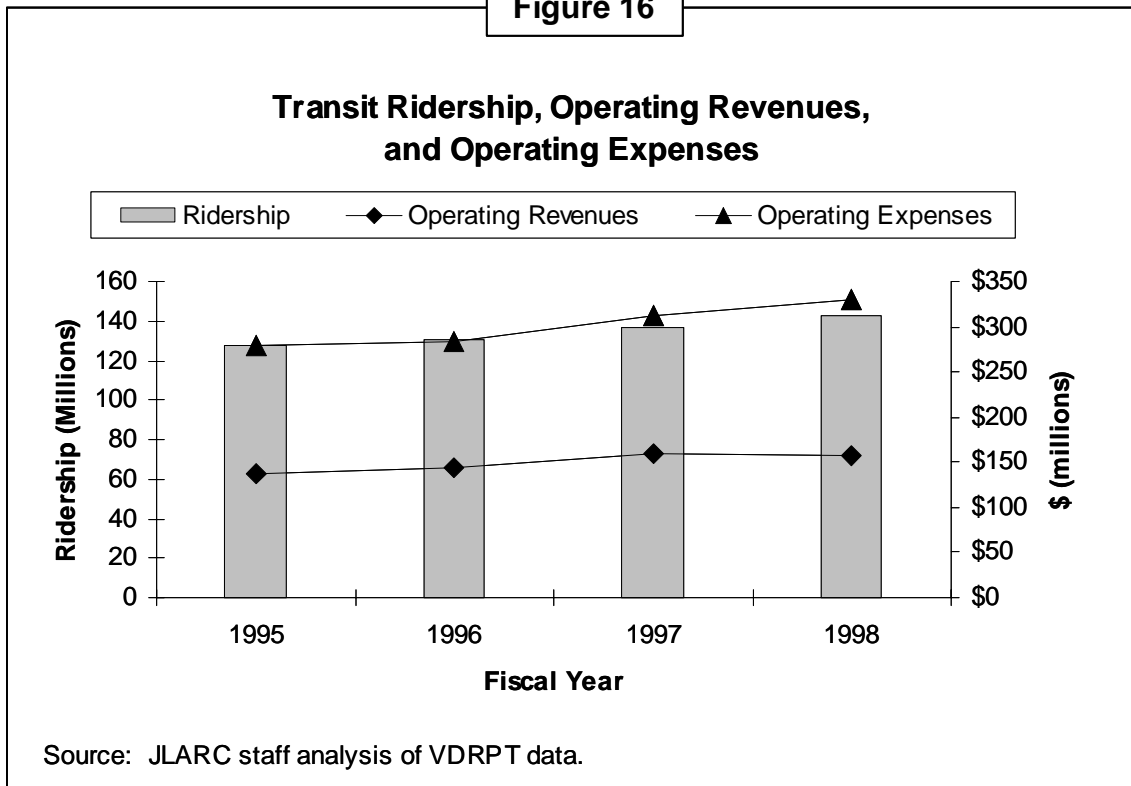
Due to the local and regional operation of transit service, connectivity between services is not always available, and transit services between regions is often limited. For example, there is no linkage for riders between James City County Transit and Hampton Roads Transit, even though the service regions are

adjacent. In some areas of the State, transit operators have worked together to form a cohesive network of service. For example, services provided by the transit operators within the Northern Virginia Transportation Commission area are all linked, and Hampton Roads Transit was recently formed from the merger of Peninsula Transit and Tidewater Regional Transit in an effort to improve regional linkages.

Transit Ridership, Revenues, and Expenses

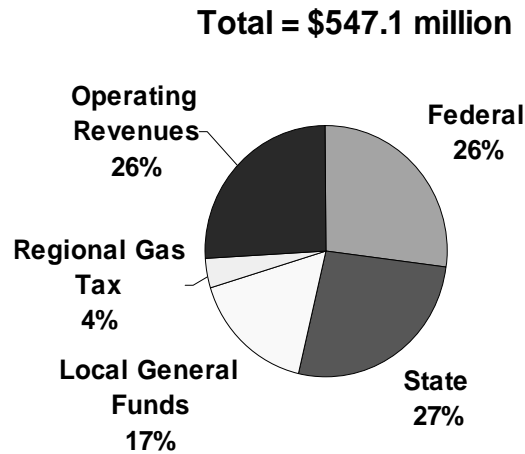
Total transit ridership exceeded 142 million in FY 1998. Operating revenues for that year were \$158 million, while total operating expenses were approximately \$330 million. Transit ridership increased by approximately 12 percent from FY 1995 to FY 1998. During this same time period, operating revenues increased by 16 percent, and operating expenses increased by 18 percent. Figure 16 shows the trends in ridership, operating revenues, and operating expenses over the four-year period.

Statewide, operating revenues represent approximately one-half of operating expenses. For most transit operators, the proportion of operating revenues to operating expenses is lower than the average. Metrorail, which accounted for over 35 percent of operating expenses statewide, met nearly 70 percent of its operating expenses through operating revenues. Transit operators receive State and local assistance to cover operating expenses not covered by operating revenue.

Figure 16

Funding of Public Transit

Fare box revenues, or user fees, cover only a portion of transit operating and capital costs. The remainder is funded through a combination of federal, State, and local assistance. Transit operators receive federal assistance through dedicated transit sources and portions of federal highway funds. State assistance derives primarily from the Commonwealth Mass Transit Fund, which is a fixed percentage of the Transportation Trust Fund. Localities served by transit are responsible for contributing the remainder of funds necessary to meet expenses. Figure 17 shows the breakdown of public transit funding between the various funding sources for FY 2000.

Figure 17**Public Transit Funding Sources FY 2000**

Source: JLARC staff analysis of data presented in House Document No. 52 of the Virginia General Assembly, 2000.

Operating Revenue. Operating revenues includes fare box revenue, which represents money received by transit operators from transit riders, and revenue from other enterprises such as advertising. The large majority of operating revenue is comprised of fare box revenue. The amount of fare box revenue generated by each operator depends on the fare price and the total number of riders. The proportion of costs covered by fare box revenue varies across transit operators, but generally represents less than one-half of operating expenses. Both Metrorail and Virginia Railway Express covered more than one-half of their operating expenses through fare box revenues. The proportion of costs covered by fare box revenues is a function of the fare, the extent of service provided, demand for service, and efficiency of operation.

Federal Assistance. Federal assistance to transit operators in Virginia is provided through 14 different federal programs, including both transit and highway programs. While transit operators within the large urbanized areas of Northern Virginia, Hampton Roads, and Richmond receive direct federal assistance, the smaller urbanized areas (under 200,000 population) and the nonurbanized areas (under 50,000 population) receive federal assistance through allocations made by the Virginia Department of Rail and Public Transportation (DRPT). Total federal funding for public transportation in Virginia equaled \$148 million in FY 2000.

The majority of federal funds (\$121 million) is distributed to transit operators through the Federal Transit Act. The Federal Transit Administration (FTA) administers these funds. The FTA provides funding for routine capital expenditures (including maintenance expenses) to transit operators in large urbanized areas, and provides funds to the Commonwealth for suballocation to transit operators in small urban and rural areas of the State. Transit operators in large urban areas received \$50 million in FY 2000, while small urban and rural areas received about \$5 million each. The FTA also administers the Fixed Guideway Program for rail, bus rapid transit, and ferry services. Under this program, WMATA and the Transportation District Commission of Hampton Roads received approximately \$47 million. Included in the Fixed Guideway Program is the New Starts Program, which is the primary source of federal funding for new transit systems or expansions to existing transit systems.

The remainder of federal transit funding in Virginia is provided through flexible transportation funds under the Transportation Equity Act for the Twenty-first Century (TEA-21). These funding sources include the Congestion Mitigation and Air Quality program, Minimum Guarantee funds, Surface Transportation program, and funds for High Priority Transit projects listed in TEA-21 legislation. Federal transit funding from flexible “highway” funds totaled \$27.8 million for Virginia in FY 2000.

State Assistance. The State provided \$146 million in operating and capital assistance to public transit agencies in FY 2000. The Commonwealth Mass Transit Fund (MTF) is the primary source of State funding, accounting for \$96 million in FY 2000. The MTF is comprised of 14.7 percent of the Transportation Trust Fund (TTF) and provides the source for State capital and operating formula assistance to the transit operators. Annual allocations to the MTF are divided into three separate programs: 73.5 percent for the Formula Assistance program, 25 percent for the Capital Assistance program, and 1.5 percent for the Special Projects program. Northern Virginia Transportation District program bonds provided an additional \$34 million for capital improvements in FY 2000.

The State Formula Assistance program provides funding for administrative expenses, rideshare expenses, and “fuel, lubricants, tires, and maintenance parts and supplies (FTM)” expenses. Formula Assistance program funds are allocated to the transit operators based on their percentage of total statewide operating expenses. However, allocations are limited to 50 percent of

administrative expenses, 80 percent of rideshare expenses, and 95 percent of FTM expenses. Thus, some transit operators may receive less than their nominal percentage of statewide operating expenses. Virginia Railway Express, for example, receives less than its nominal percentage of operating expenses due primarily to its high proportion of fare box revenues to operating costs.

The Capital Assistance program provides funding to transit operators primarily for routine capital costs, such as the purchase of new vehicles, facilities, and equipment. Annual allocations are based on applications submitted by transit operators detailing their capital projects for the year. DRPT reviews the applications and determines the total cost of all eligible capital projects, excluding any portion of the costs covered by federal assistance. DRPT then calculates the percentage of total Capital Assistance program funds to total capital project needs and distributes funds to all projects based on this proportion. This proportion varies from year to year based on available funds and capital project needs. In FY 2002, the State provided funding for 43 percent of the non-federal share of capital costs of eligible projects. The maximum allowable State participation rate is 95 percent.

The Special Projects program, which represents 1.5 percent of the MTF, is used to help fund demonstration projects, transportation demand management projects, and special studies. These funds are awarded on a competitive basis and approved by the CTB. Funds from this program have been used for the start-up of small transit systems and for congestion mitigation initiatives in congested areas of the State.

The Department of Rail and Public Transportation recently completed a review of State MTF allocations to transit operators. The study focused on the Formula Assistance program and presented options for the equitable and efficient distribution of funds. The study recommended only minor modifications to the current formula. These recommended changes included the use of a fiscal stress factor in the formula allocation, and a provision to protect operators from being penalized for reducing their operating expenses.

The Virginia Transportation Act provided additional funding for transit during the present biennium. The General Assembly directed that six percent of federal Surface Transportation program funds and ten percent of Minimum Guarantee funds be designated for transit beginning in FY 2001. In addition, the General Assembly appropriated \$35 million in General Funds for the 2001-02 biennium for a mass transit assistance program and \$4 million for Virginia Railway Express to provide funding for new transit vehicles and equipment. These funds have been combined to establish a new capital assistance program for transit. The new program, which is called the State Vehicle and Equipment Assistance program, is similar to the existing Capital Assistance program and is being used to provide capital assistance primarily to small transit providers. While the Capital Assistance program provides 43 percent of the non-federal share of capital needs of eligible projects, the new mass transit assistance program provides an 80 percent match for those transit operators who are eligible.

Local Assistance. Localities provide the remainder of funds needed to operate and maintain transit services. In FY 2000, localities provided \$111 million, which included approximately \$20 million of Northern Virginia regional gas tax funds. Local general funds accounted for \$91 million.

Disincentive for Localities to Invest in Transit Alternatives

Due to differences in State funding for highways and public transit, transit operators contend that there is an inherent disincentive for a locality to use construction funds to invest in transit instead of road projects. They assert that given a choice between investing in a transit project or a highway project to meet a transportation need, a locality will almost always invest in a highway project because of the ongoing costs that a locality will have to assume for a transit project. While the construction and maintenance costs of highway projects are funded by the State, localities are required to assume some of the ongoing financial responsibility for operating and routine capital expenses incurred by transit operators. Transit operators contend that this deters local governments from selecting transit projects over highway projects even when a transit project might better meet the transportation need.

INTERMODAL TRANSPORTATION PLANNING IS NEEDED TO ENSURE INFORMED TRANSPORTATION FUNDING DECISIONS

Intermodal transportation planning is currently limited in Virginia, yet transportation challenges appear to increasingly require consideration of intermodal solutions. With multimodal alternatives available to meet transportation demand and limited transportation funds available, it will become

increasingly important for transportation policy makers to receive intermodal analysis and recommendations from professional staff with an inter- and multimodal perspective. A separate intermodal office needs to be established and other minor organizational changes made in order to foster an intermodal approach to transportation in Virginia.

Intermodal Transportation Planning Is Limited

Transportation planning is currently conducted at the agency level within the transportation secretariat. The planning division within VDOT conducts highway planning and the Department of Rail and Public Transportation conducts some transit planning. There are no professional staff with responsibility for examining transportation from an intermodal perspective or for coordinating planning among modes of transportation. Instead, transportation planners within VDOT focus on highway planning, and similarly, staff at DRPT focus on transit issues. The lack of cooperation between the agencies appears to be exacerbated by the competition between agencies for limited transportation funds.

As Transportation Challenges Increase, Intermodal Transportation Solutions Become Increasingly Important, but Funding Is Limited

As traffic congestion grows in major urban corridors and additional road expansion becomes a more costly option, other modal options are increasingly being considered to address congestion and meet transportation demand. For example, two studies have been conducted in the Interstate 66 corridor to assess how to best meet the demand in that corridor. In addition, multiple studies have been conducted to assess how to address traffic in the

beltway corridor around Washington. In both corridors, potential solutions to address congestion include transit alternatives. Further, as part of consideration of options for construction of a third crossing in Hampton Roads, consideration is being given as to whether the proposed crossing should include light rail.

Long range plans for Northern Virginia and Hampton Roads both include major planned transit projects. As discussed in Chapter III, the Northern Virginia 2020 plan includes transit projects totaling \$8.5 billion in projected costs. The Hampton Roads 20-year plan includes three major new transit projects totaling \$2.2 billion.

While transit needs appear to be increasing, funding for major new capital projects is scarce. The Federal Transit Administration allocates some capital funds for transit projects. However, according to the deputy director of DRPT, the most Virginia can expect to receive in federal funds for any capital transit project under the current federal structure is 50 percent of the cost. Additional funds would have to be State, regional, or local funds.

Currently designated transit funds would not be sufficient to fund major new capital projects. Virtually all of the State transit funds are presently going to pay for operating and routine capital expenses. The lack of State funds available to fund major new transit projects is evidenced by the difficulty the State is having contributing its share of the funding for the Dulles Rail project. Part of the State share will come from VTA funds and toll revenue from the Dulles toll road. However, according to the deputy director of DRPT, the agency will still have to

ask the General Assembly for additional funds in order to pay the State share of the project.

Along with the increasing need for multimodal solutions, there is increasing interdependence among modes of transportation, leading to a need for coordination among them. The effectiveness of a commuter rail system is dependent on good access and parking for the system. According to a Virginia Rail Express official, there needs to be more coordination between VDOT and VRE regarding parking at VRE stations. A former VDOT official told JLARC staff that there has been a lack of coordination among modes in planning for the Jamestown 2007 celebration. In addition, a VDOT official indicated that there has been insufficient coordination between the Department of Aviation and VDOT regarding planning for a new eastern airport.

Professional Staff Are Needed to Conduct Intermodal Analysis and Provide Recommendations

Given the increasing importance of transit solutions to address transportation challenges and the limited funding currently available, the need for professional staff to assist in analyzing transportation solutions from an intermodal perspective appears to be increasingly important. In major transportation corridors, multiple modal options have to be considered for addressing travel demand. In addition, with limited funds and growing demand for transportation solutions, difficult choices will be required as to how to allocate transportation funds among modes. Finally, the interdependence among modes will require increased coordination as projects are developed.

Intermodal Analysis in Transportation Corridors. One of the limitations of the current planning process is that there are no professional staff with responsibility for intermodal transportation planning involved in studying major transportation corridors and proposed solutions needed to address travel demand in those corridors. A good example of the need for such professional staff is the current planning process within the Washington beltway corridor. VDOT previously conducted a major investment study of the corridor to consider alternatives to address travel demand and is now conducting a more extensive study of possible alternatives through the Environmental Impact Statement process. Simultaneous with the VDOT studies, DRPT has conducted a rail feasibility study to consider possible rail alternatives for the corridor. The EIS study appears to be focusing on highway solutions to meet transportation demand in the corridor while the DRPT study focused on rail alternatives. After the completion of these studies, there will need to be an assessment of the conclusions of each study by professional staff with an intermodal perspective so that recommendations can be developed and professional advice provided as to the most effective transportation solutions for the corridor. However, currently there are no professional staff within the transportation secretariat to conduct such an analysis or advise the CTB.

CTB Will Be Required to Make Difficult Decisions About the Use of Transportation Dollars. Given the increasing importance of transit solutions to address travel demand and the limited funding dedicated for it, there will be increasing pressure on the CTB to decide whether to allocate funds traditionally

allocated for highway projects to major new transit projects in heavily congested corridors. In order to make such decisions, it will be critical for the CTB to receive professional analysis and recommendations from staff who are examining transportation options from an intermodal perspective. Without such input, it will be difficult for the CTB to ensure that it is making fully informed decisions about how to allocate transportation dollars.

Intermodal Transportation Staff Could Also Be Used to Ensure Coordination in Planning Between Modes. Currently, there are no professional staff outside of the individual agencies to coordinate planning between modes when such planning is needed. Professional staff within a multimodal planning office would be able to facilitate planning among agencies and transportation modes when such coordination is required. In addition, they could help to find and coordinate financing for major projects that involve multiple transportation modes.

Intermodal Transportation Office Needs to Be Separate, and Other Organizational Changes Are Needed

A separate intermodal office needs to be established with professional intermodal staff. The office should be located in the transportation secretariat but separate from VDOT and DRPT. The CTB should appoint the director of the intermodal office, and the staff should report to the Secretary of Transportation and CTB. The staff should be required to have planning or other relevant training necessary to perform the responsibilities required of the office.

Along with the creation of this separate intermodal office, the office of the Secretary of Transportation needs to be removed from its current physical

location within VDOT. With the Secretary's office located in such close proximity to VDOT's executive staff in recent years, the Secretary of Transportation has become active in the day-to-day operations of VDOT. While this enables the Secretary to be more involved in VDOT's operations, it may limit the Secretary's ability to maintain an intermodal transportation perspective, and may create the perception that the Secretary has a highway bias. To encourage a broader intermodal perspective by the Secretary, it may be useful to move the office of the Secretary to a location physically separated from VDOT staff, like other Secretaries who are located separately from their agencies.

Finally, the General Assembly may wish to amend the current provision that makes the Commissioner of VDOT the vice-chair of the CTB. With the CTB responsible for all transportation issues, the vice-chair of the Board should not be from a particular agency within the transportation secretariat. One solution to address this issue would be to designate that the vice-chair of the CTB should be selected by a majority vote of the voting members of the CTB.

Recommendation (16). The General Assembly may wish to consider amending the *Code of Virginia* to establish an intermodal office within the transportation secretariat that is staffed by professionals, including a director who is appointed by the Commonwealth Transportation Board. The intermodal office would be responsible for advising the Secretary of Transportation and the Commonwealth Transportation Board on intermodal issues.

Recommendation (17). To enhance the intermodal role of the Office of the Secretary of Transportation, the Governor and the Secretary of Transportation may wish to consider moving the Office of the Secretary to a location physically separate from all of the agencies within the transportation secretariat.

Recommendation (18). The General Assembly may wish to consider amending §33.1–1 of the *Code of Virginia* to require that the vice-chair of the Commonwealth Transportation Board be selected from among the voting members of the Board by a majority of the voting members of the Board.

Appendixes

Appendix A: National Highway System Route Segments in
Urbanized Areas

A-1

Appendix B: Technical Appendix

B-1

Appendix A

National Highway System Route Segments in Urbanized Areas

In addition to the routes shown in figures 6, 9, and 10 of this report, the National Highway System (NHS) also contains numerous road segments in urbanized areas. These road segments are listed below for each urbanized area of the State. With the exception of the Interstate highway system, NHS routes may only comprise a portion of the highways listed below.

Urbanized Area	Interstate Routes	U.S. Routes	State Routes	Secondary/ Local Roads
Bristol / Kingsport	81 381	19 23	140 381	
Charlottesville	64	29 250		
Danville		29 58		
Fredericksburg	95	1 17	3	
Hampton Roads	64 264 464 564 664	13 17 58 60 258 460	10 32 104 105 134 141 143 164 165 166	167 168 170 199 225 238 306 337 406 <i>Hampton:</i> Armistead Ave., Hampton Roads Center Pkwy. <i>Virginia Beach:</i> 21 st Street. 22 nd Street, Oceana Blvd.
Lynchburg		29 460 Bus. 460		

Urbanized Area	Interstate Routes	U.S. Routes	State Routes		Secondary/ Local Roads	
Northern Virginia	66 95 395 495	1 15 17 29 50 340	7 27 28 110 120 123 234 267		Fairfax County: 608 613 617 636 638 641 7100	Prince William County: 619 3000
Richmond/ Petersburg	64 85 95 195 295	1 33 60 250 301 360 460	10 36 40 73 76 144	146 150 156 195 197 288	895 (Pocahontas Pkwy.) Laburnum Ave. Parham Road	
Roanoke	81 581	11 220 460	101 112 115 117 220 419			
Source: JLARC staff analysis of Highway Performance Monitoring System, 2000 data.						

Appendix B

Technical Appendix

Most of the findings in this report are based on statistical as well as other quantitative analysis. The following appendix discusses the methodology used to perform much of this analysis. It includes a discussion of the process used to assess need using the federal Highway Economic Requirements System (HERS), as well as the methodology used to assess urban local road needs in cities and towns within the urban system and the counties of Arlington and Henrico. In addition, it includes a discussion of the statistical analysis used to develop formulas for the distribution of highway construction funds. Finally, it discusses the methodology used to develop the 20-year revenue estimate used by JLARC staff to assess the adequacy of highway construction funding.

MODIFICATIONS TO HERS/ST MODEL FOR ESTIMATION OF REGIONAL NEEDS

Several aspects of the state version of the Highway Economic Requirements System model (HERS/ST) were modified in order to estimate highway construction needs across functional class systems and geographic regions of the State. JLARC staff changed one default parameter supplied by the HERS/ST model. In addition, the sample road segment expansion factors were discounted, and new regional expansion factors were developed. Finally, National Highway System (NHS) needs were estimated for each functional class in order to separate statewide system needs from regional and local system needs.

One HERS/ST Default Parameter Setting Was Changed

The HERS/ST model contains default parameters to specify improvement costs, traffic growth rates, minimum benefit-cost ratios, maximum number of lanes on a highway segment, induced travel effects, and several other factors. Nearly all default parameter values supplied with the model were left unchanged. However, one default parameter – maximum number of lanes per segment – was changed in order to produce a more realistic assessment.

The HERS/ST default setting for maximum number of lanes per segment was 99. Because it is unrealistic to assume any highway segment would be widened to such an extent, JLARC staff specified a maximum of 16 lanes per principal arterial segment, and 12 lanes per minor arterial or collector segment. By choosing these limits, the model addressed needs on highly congested roadways but did not allow for the unrealistic addition of lanes. Currently, the maximum number of lanes on a principal arterial roadway is 13, while the maximum number of lanes on all other roadways is ten.

One of the key parameters for the HERS/ST analysis is the benefit-cost ratio (BCR) of road segment improvements. JLARC staff determined that the default BCR value of one was appropriate for use in the needs assessment. HERS/ST estimates highway user, agency, and external benefits and capital costs for each improvement. Highway user benefits include reduced travel time and operating costs, and increased levels of safety. Agency benefits include reduced maintenance costs and the residual value of the improvement – e.g., the salvage value of the improvement or the value of avoiding future improvement costs. External benefits consist of reductions in vehicle emissions. Those

improvements in which the sum of benefits was greater than the capital cost of the improvement had a BCR greater than one and were counted. Improvements that corrected a deficiency but resulted in a net loss in benefits were not counted in the needs assessment.

Regional Expansion Factors Developed and Regional Needs Estimates Adjusted

The sample size used in the HERS/ST model and the expansion factors assigned to each highway segment in the sample were designed to produce statewide needs estimates. Because the seven regions proposed by JLARC staff are not represented proportionally across all functional classes, the expansion factors were discounted and new regional expansion factors were developed to estimate the total needs within each funding region. These regional expansion factors were based on the proportion of functional class roadway miles represented in the sample within each region. For example, if a funding region has 50 miles of rural Interstate roadway and the sample contained 10 miles for that region, then any estimated improvement costs on those samples (the need amount) would be multiplied by five to estimate total rural Interstate needs in the region. Traffic volume data could not be used in the calculation of expansion factors because of the lack of data on individual road segments.

Because the HERS/ST expansion factors were discounted and new regional expansion factors developed, the total functional class needs estimates were modified from the original HERS/ST functional class needs estimates. The HERS/ST functional class needs estimates had to be kept constant, as they form the basis for determining proportional needs between the statewide, regional,

and local systems. Thus, functional class needs estimates within each funding region were multiplied by an adjustment factor so that the sum of functional class needs estimates across the seven funding regions would be equal to the original HERS/ST estimate. The adjustment factor was the ratio of the HERS/ST generated functional class needs estimate to the functional class needs estimate generated by the regional expansion factors. Exhibit B-1 uses a hypothetical example to illustrate how the adjustment factors were applied to functional class estimates within each region.

Estimation of National Highway System Needs Within Functional Classes and Funding Regions

After developing needs estimates by functional class and funding region, needs estimates were then produced for statewide, regional, and local systems. The statewide system is composed of all National Highway System

Exhibit B-1

Hypothetical Example of Application of Adjustment Factor to Functional Class Need within Funding Region

HERS/ST estimated total urban collector needs at \$1 billion over ten years. After discounting HERS/ST expansion factors and applying new regional expansion factors, total urban collector needs were estimated at \$1.2 billion. Using the regional expansion factors, urban collector needs within the Richmond/Tri-Cities MPO were estimated at \$300 million. This regional estimate was adjusted as follows:

$$\begin{aligned} \text{Adjusted need} &= \$300 \text{ million} \times \frac{\$1 \text{ billion}}{\$1.2 \text{ billion}} \\ &= \$250 \text{ million} \end{aligned}$$

Source: JLARC staff analysis.

(NHS) roads, while the regional system is composed of all non-NHS arterial roads, and the local system is composed of all non-NHS collector and local roads. Because the HERS/ST model does not distinguish needs between NHS and non-NHS roads, these needs were estimated using proportional lane miles as the basis for distributing needs between NHS roads and non-NHS roads. Functional class needs generated by HERS/ST were distributed between NHS and non-NHS roadways according to the proportion of NHS lane miles within each functional class to produce statewide, regional, and local system needs estimates. This process was repeated within each funding region to produce statewide, regional, and local system needs for each region.

ESTIMATION OF NON-TOLERABLE LOCAL ROAD NEEDS IN URBAN SYSTEM LOCALITIES AND THE COUNTIES OF ARLINGTON AND HENRICO

The Virginia Department of Transportation (VDOT) conducted an analysis of non-tolerable local road needs on State-maintained roads in Virginia counties. VDOT did not conduct a similar assessment of non-tolerable local road needs in the counties of Arlington and Henrico, nor in the cities and towns within the urban system. In order to account for the local road needs in these localities, the needs were estimated using a weighted average of urban local road needs in the counties.

VDOT conducted an analysis of non-tolerable urban local road needs for the 24 counties in the secondary system that have urban roads and the portion of the city of Suffolk that is in the secondary system. For each of these 25 localities, the needs estimate was divided by the number of urban local lane miles in the locality to produce needs estimates on a per-lane-mile basis. Urban

local needs per lane mile ranged from zero in the counties of Montgomery and Prince George to \$156,000 in Scott County. The average needs per lane mile was \$38,088.

Because the extent of urban local lane miles varies significantly among the localities, the per-lane-mile needs estimate for each locality was weighted by the percentage of urban local lane miles in the locality to the total urban local lane miles for all 25 localities in the analysis. Thus, the per-lane-mile needs estimate for Fairfax County, which contains nearly 3,900 urban local lane miles, was assigned a much higher weight than the per-lane-mile needs estimate for Henry County, which contains only 61 urban local lane miles. The weighted average of urban local needs per lane mile was \$23,925.

Urban local road needs for cities and towns in the urban system and the counties of Arlington and Henrico were estimated based on the per-lane-mile weighted average of \$23,925. This weighted average was then multiplied by the number of urban local lane miles in each locality to produce total urban local needs for each locality.

METHODOLOGICAL APPROACH TO THE SELECTION OF PROXIES

Proxies for use in regional and local system allocation formulas were selected using statistical methods and a qualitative analysis of the factors. The purpose of this analysis is to identify the factor or combination of factors that most closely approximates the needs estimated from the seven regions. The primary criterion for choosing the best factor is how strongly it is associated with the estimated needs. The strength of this association is measured using two

related statistical concepts: the correlation coefficient (r), and the coefficient of determination (R^2). Correlation analysis was applied to determine relationships between individual factors and need. Regression analysis was then applied to determine which combinations of factors would be most effective as proxies for need, as well as to determine appropriate factor weights.

This analysis of the relationships between highway construction needs and factors is not conventional inferential statistics, as the analysis uses population data – not sample data. While seven data points would be insufficient for conventional inferential statistical analysis, this relatively small number is adequate for characterizing the relationships between the factors with needs, because no attempt was made to make inferences from a sample to a broader population. Although correlation and regression analyses are more often used to help make inferences about a population from a sample, the descriptive statistics resulting from these analyses are also appropriate measures for the characterization of relationships among factors in a population.

Use of Correlation and Regression Analysis

The relationships of the factors with regional and local highway construction needs were tested using correlation and regression analysis. Correlation analysis measures the relationship between two factors by calculating a correlation coefficient, designated “ r ,” which can range in value from -1.0 to $+1.0$. The correlation coefficient is a measure of the strength of the relationship between the factors, where values close to ± 1 show a strong relationship between the factors, and values close to zero show a weak

relationship. If r is greater than zero, then the factors are positively correlated – values of one factor generally increase as values of the other factor increase. Conversely, values of negatively correlated factors generally will move in opposite directions. Factors that were positively correlated with highway construction needs were selected for further analysis in linear regression models.

Regression models were developed using combinations of independent factors. Correlations between factors were used to test the independence of the factors being considered in combination as possible proxies for highway construction needs. Factors are perfectly independent if the correlation between them is zero. Because the actual correlation coefficient is rarely equal to zero, combinations of factors were only excluded if they had a very strong positive or negative correlation coefficient (close to +1 or -1). By selecting only those factors that were not strongly intercorrelated, the models did not contain multiple factors that had the same effect. Thus, the regression models were able to estimate the independent relationship of each factor with highway construction needs. The factors could be assigned their relative weight given their influence on changes in relative highway construction needs between regions of the State.

Some factors that were not highly correlated with highway construction needs were also considered for further analysis in regression models. Based on reasonable assumptions regarding their importance in explaining relative needs, and their independence from other factors in the model, they were included in the regression analysis to determine if they had an independent effect on highway

construction needs. A factor may not be correlated with construction need, but given the effects of other factors in the model, it may have a substantial independent effect on the power of the model to explain differences in need.

Selection of Allocation Models and Application of Factor Weights

Selection of allocation models was based on results of the regression analysis. Two important statistics for use in determining the proxies that best represent relative highway construction needs: (1) the coefficient of multiple determination (R^2), and (2) the regression coefficient associated with each of the factors. The R^2 measures the amount of variation in the dependent variable that is associated with the independent variables, while the regression coefficient determines the weight that should be associated with each independent variable.

The coefficient of multiple determination, or R^2 , measures the percentage of variation in the dependent variable (highway construction needs) that is explained by the combination of independent variables. The R^2 value is similar to the correlation coefficient, but it measures the combined relationship of all factors considered (which may include two or more factors) with the dependent variable. Its value ranges from 0 to +1, where a value of zero implies no relationship, and a value of one means that 100 percent of changes in the dependent variable are explained by the combination of factors. When comparing alternative combinations of factors, the combination with the highest R^2 is chosen for the determination of proxies and their corresponding weights.

The regression coefficients for each independent factor measure the predicted change in the dependent variable with changes in values of the factors.

When the values of all variables in the regression are standardized to a mean of zero and standard deviation of one, the standardized regression coefficients represent the relative importance of each factor in estimating the dependent variable. The regression coefficients were then used to calculate weights for the factors by determining the percentage of each coefficient to the total. The calculation of weights based on regression model results is illustrated in Exhibit B-2.

Exhibit B-2

Calculation of Factor Weights Using Multiple Regression Analysis

$$Y = \alpha + \beta_1 X_1 + \beta_2 X_2, \text{ where:}$$

Y represents the dependent variable (e.g., highway construction needs),
 α is the equation constant or Y intercept (not applicable for this analysis),
 β_1 and β_2 are the regression coefficients, and
 X_1 and X_2 are the observed values of the independent factors.

The weight for factor X_1 equals:

$$\frac{\beta_1}{(\beta_1 + \beta_2)}$$

The weight for factor X_2 equals:

$$\frac{\beta_2}{(\beta_1 + \beta_2)}$$

Source: JLARC analysis of factor weights.

ANALYSIS OF RELATIONSHIPS BETWEEN POSSIBLE PROXIES AND REGIONAL SYSTEM NEEDS

The relationships between the factors and regional needs are shown through the correlation coefficients and regression results. Correlation coefficients between all factors and regional system highway construction needs are shown in this appendix, as well as the correlation coefficients between the factors. Finally, alternative combinations of factors are compared through their respective coefficients of multiple determination.

Correlation Analysis of Factors with Regional System Needs

Correlation analysis was used to determine the relationships between regional system needs and each of the factors. The correlation coefficients for each of the factors are shown in Table B-1. Several of the system demand factors had a high positive correlation with regional system needs. The system size factors had correlation coefficients that were negative or slightly positive. Total registered vehicles had the highest correlation coefficient of the factors tested.

Regression Analysis of Independent Factors

Several of the demand factors were highly correlated with regional system construction needs. However, the system demand factors are likely to be highly correlated with each other, because they are similar in what they measure. Table B-2 shows the correlation coefficients between three of the factors with the highest construction needs correlation (total registered vehicles, population, and vehicle miles traveled) with the other factors. As expected, all of the system

Table B-1	
Correlation Coefficients of Factors with Regional System Needs	
<u>Factor</u>	<u>Coefficient</u>
Total Registered Vehicles	0.963
Regional System Vehicle Miles Traveled	0.961
Registered Passenger Vehicles	0.955
Projected Population (2010)	0.948
Population (2000)	0.947
Employment (civilian employees)	0.934
Business Establishments	0.934
Licensed Drivers	0.923
Population per Regional System Lane Mile	0.827
Vehicles per Regional System Lane Mile	0.807
Population Density	0.806
Population Change (1990-2000)	0.726
Per Capita Income	0.698
Regional System Lane Miles	0.320
Regional System Centerline Miles	-0.092
Accidents per Vehicle Miles Traveled	-0.125
Land Area	-0.682
Acres of Farmland	-0.697
Poverty Rate	-0.805
Source: JLARC analysis of factors.	

demand factors were highly correlated with each other, so they should not be used together in a regression model.

Because total registered vehicles had the highest correlation with regional system needs, it was chosen above the other system demand factors as a proxy for regional system needs. The factors that were independent of total registered vehicles were not positively correlated with regional needs, but were

Table B-2 Correlation Coefficients Between Factors			
<u>Factor</u>	<u>Total Registered Vehicles</u>	<u>Population</u>	<u>Vehicle Miles Traveled</u>
Total Registered Vehicles	1.00	-	-
Population (2000)	.992	1.00	-
Vehicle Miles Traveled	.962	.947	1.00
<i>Other System Demand Factors</i>			
Business Establishments	0.984	0.982	0.934
Employment (civilian employees)	0.990	0.992	0.934
Licensed Drivers	0.988	0.994	0.925
Population Density	0.914	0.945	0.821
Population per Regional System Lane Mile	0.903	0.941	0.810
Projected Population (2010)	0.990	0.999	0.955
Registered Passenger Vehicles	0.999	0.996	0.954
Vehicles per Regional System Lane Mile	0.883	0.921	0.779
<i>System Size Factors</i>			
Land Area	-0.679	-0.741	-0.655
Regional System Centerline Miles	-0.098	-0.197	0.011
Regional System Lane Miles	0.270	0.173	0.397
<i>Other Factors</i>			
Accidents per Vehicle Miles Traveled	-0.105	-0.018	-0.273
Acres of Farmland	-0.678	-0.735	-0.675
Per Capita Income	0.789	0.773	0.761
Poverty Rate	-0.826	-0.776	-0.849
Source: JLARC analysis of factors.			

tested with registered vehicles to determine if, in combination, they might have an independent association with regional needs that could result in a better proxy. Based on their independence from total registered vehicles, land area, regional system centerline miles, regional system lane miles, accident rate per VMT, and acres of farmland were each tested in regression models with total registered vehicles to determine if they had a substantial independent association that would result in a better proxy. The results of the regression models representing these combinations of factors are shown in Table B-3. The alternative models were compared using the adjusted R^2 statistic (the R^2 value is adjusted for degrees of freedom and is therefore more useful than the regular R^2 value when comparing models with different numbers of independent factors). None of the alternative models had an adjusted R^2 value as high as the model containing only total registered vehicles.

Table B-3	
Comparison of Alternative Regional System Models	
<u>Model</u>	<u>Adjusted R^2</u>
Total Registered Vehicles	.9136
Total Registered Vehicles with:	
Centerline Miles	.8920
Lane Miles	.8978
Land Area	.8943
Farm Acres	.8974
Accident Rate per VMT	.8929
Source: JLARC analysis of factors.	

ANALYSIS OF RELATIONSHIPS BETWEEN POSSIBLE PROXIES AND LOCAL SYSTEM NEEDS

The same methodology that was applied to the selection of regional system need proxies was also applied to the selection of proxies for local system needs. The correlation coefficients between local system needs and factors are listed in this appendix, along with correlations between factors. This section also contains the coefficients of multiple determination of the alternative models. Finally, the methodology for determination of factor weights is described.

Correlation Analysis of Factors with Local System Needs

Correlation analysis was performed to test the relationships of the various system demand, system size, and other factors with local system needs. Contrary to the correlation analysis of regional system needs, the system size factors are all strongly correlated with local system needs, while the system demand factors are either negatively correlated with need or have no correlation. Local system centerline miles has the highest correlation coefficient of the factors tested, followed closely by local system lane miles, land area, and acres of farmland. Table B-4 lists the correlation coefficients for all factors tested.

Regression Analysis of Independent Factors

The independence of the factors was tested through correlation analysis to determine the combinations of factors that could be used together in regression analysis. The cross-correlations between the factors revealed that the system size variables were not independent, as shown in Table B-5. However, the system size variables were not highly correlated with several of the

Table B-4	
Correlation Coefficients of Factors with Local System Needs	
<u>Factor</u>	<u>Correlation Coefficient</u>
Local System Centerline Miles	0.964
Local System Lane Miles	0.963
Land Area	0.956
Acres of Farmland	0.952
Poverty Rate	0.320
Local System Vehicle Miles Traveled	-0.079
Total Registered Vehicles	-0.452
Population Change (1990-2000)	-0.456
Registered Passenger Vehicles	-0.485
Licensed Drivers	-0.531
Population (2000)	-0.531
Employment (civilian employees)	-0.533
Per Capita Income	-0.539
Projected Population (2010)	-0.542
Business Establishments	-0.553
Population Density	-0.643
Persons per Local System Lane Mile	-0.686
Vehicles per Local System Lane Mile	-0.692
Accidents per Vehicle Miles Traveled	-0.732
Source: JLARC analysis of factors.	

system demand factors. These demand factors were tested with system size factors to determine if the demand factors had an independent association with local system needs.

Given that the factor of local centerline miles had the highest correlation with local system needs, it was used along with several system

Table B-5			
Correlation Coefficients Between Factors			
<u>Factor</u>	<u>Centerline Miles</u>	<u>Lane Miles</u>	<u>Land area</u>
Centerline miles	1.00	-	-
Lane miles	1.00	1.00	-
Land area	.981	.978	1.00
<i>System Demand Factors</i>			
Business establishments	-0.675	-0.664	-0.751
Employment (civilian employees)	-0.656	-0.645	-0.738
Licensed drivers	-0.653	-0.642	-0.736
Persons per local system lane mile	-0.776	-0.766	-0.846
Population (2000)	-0.650	-0.639	-0.741
Population change (1990-00)	-0.568	-0.554	-0.597
Population density	-0.731	-0.719	-0.797
Projected population (2010)	-0.661	-0.651	-0.749
Registered passenger vehicles	-0.613	-0.603	-0.705
Registered vehicles per local system lane mile	-0.784	-0.774	-0.851
Total registered vehicles	-0.584	-0.574	-0.679
Vehicle miles traveled (VMT)	-0.208	-0.207	-0.323
<i>Other Factors</i>			
Accidents per VMT	-0.769	-0.758	-0.836
Acres of farmland	0.970	0.968	0.996
Per capita income	-0.623	-0.611	-0.648
Poverty rate	0.471	0.462	0.496
Source: JLARC analysis of factors.			

demand factors in regression models to determine if any of the demand factors had an independent effect on local system needs. The demand factors were all inter-correlated, so only one factor could be added to local centerline miles in the

regression model. Population, population change, total registered vehicles, local system VMT, and licensed drivers were the demand factors tested in the regression analysis with centerline miles. The poverty rate and per capita income were also tested with centerline miles to determine if they have a substantial independent association with local system needs. None of these factors were excessively correlated with centerline miles, so the regression coefficients should be unbiased. Table B-6 shows the adjusted R^2 of each of the combinations of factors.

Of the eight combinations examined, the combination of local system centerline miles and poverty rate produced the highest adjusted R^2 . However, the regression coefficient for poverty rate was a negative value, and therefore

Table B-6 Comparison of Alternative Regional System Models	
<u>Model</u>	<u>Adjusted R^2</u>
Local System Centerline Miles	.914
Local System Centerline Miles with:	
Population	.916
Population Change	.911
Total Registered Vehicles	.921
Licensed Drivers	.918
Local System VMT	.916
Poverty Rate	.927
Per Capita Income	.902
Source: JLARC analysis of factors.	

would not be useful in assigning weights to the factors. The negative weight attached to the poverty rate would also mean that localities would be penalized for having more persons living below the poverty line – a consequence the State would probably want to avoid.

The combination with the next highest adjusted R^2 is the combination of local system centerline miles and total registered vehicles. The regression coefficient for total registered vehicles is positive, so it is appropriate to use the coefficient as a weight in an allocation formula.

Calculation of Weights for Local System Centerline Miles and Total Registered Vehicles in Local System Allocation Formula

The calculation of weights for the two factors is based on the regression coefficients in the model. The values of the factors were standardized in the regression model in terms of standard deviations from the mean. Thus, the regression coefficients represent proportional effects on variation in local system need. Table B-7 shows the regression coefficients for the factors and the percentage weights assigned to each. The percentage of each coefficient to the

Table B-7		
Calculation of Factor Weights for Local System Need Proxies		
<u>Factor</u>	<u>Regression Coefficient</u>	<u>Percentage Weight</u>
Local System Centerline Miles	1.062	86%
Total Registered Vehicles	0.169	14%
Total	1.232	100%
Source: JLARC analysis of factors.		

total value of the coefficients represents the relative importance of each factor in the model, and is the basis for each of the factor weights.

20-YEAR REVENUE FORECAST

As part of its assessment of the adequacy of existing funding sources, JLARC staff developed a 20-year estimate of VDOT revenues and expenditures. Although JLARC staff based its estimate on information provided by VDOT, JLARC staff adjusted the VDOT forecast to better reflect historic trends because of concerns about some of the assumptions used in VDOT's revenue forecast.

VDOT 25-Year Revenue and Expenditure Forecast

The most recent VDOT long-range forecast covers the fiscal years 2001 through 2025. It was developed by staff in VDOT's financial planning and debt management division during the fall of 2000. VDOT staff indicated that they did not update the forecast after the Commonwealth Transportation Board approved VDOT's FY 2002 budget because the six-year plan, which impacts the expenditure forecast, had not been approved.

The revenue assumptions for fiscal years 2001 through 2006 were derived from a special revision to the official Commonwealth Transportation Fund forecast developed by the Department of Motor Vehicles during the summer of 2000 at the request of the Secretary of Transportation. DMV's estimates of State revenues were based on DMV's Commonwealth Transportation Fund model – a regression-based model that uses DRI-WEFA's nationally recognized economic forecast. Beyond the first six years of the forecast, VDOT staff relied on trend line analysis to predict availability of State funding for the remaining years of the

analysis period. Anticipated national-level federal revenues beyond 2004 were estimated using the U.S. Energy Information Administration's estimates of vehicle miles traveled and average fuel economy. Virginia's share of federal revenues was assumed to be the average percentage of the total that Virginia received between 2001 and 2003.

The expenditure assumptions for the first six years of VDOT's forecast are those used to develop the FY 2001 VDOT budget and six-year plan. Beyond FY 2006, VDOT used trend line analysis to estimate growth in certain programs, and for others, assumed expenditures would not increase throughout the 25-year analysis period.

JLARC Staff 20-Year Revenue and Expenditure Forecast

The JLARC staff 20-year revenue forecast mirrors, to a large extent, the VDOT forecast. However, because of concerns about assumptions included in VDOT's revenue forecast and its application of linear trend line analysis to what are likely to be nonlinear (curved) trends, JLARC staff adjusted certain assumptions in the VDOT forecast.

Assumptions Regarding Available Revenues. On the revenue side, the JLARC staff projection produced an anticipated \$75 billion in total transportation revenues between 2002 and 2021. The VDOT estimate was just four percent lower, at \$72 billion. The causes of the variation between these estimates are as follows. First, JLARC staff were able to use more recent estimates of federal revenues than were available to VDOT staff last year. Second, VDOT assumed that it would not receive any federal demonstration or

high priority project funds after 2003. Because such allocations have been included in all federal highway authorizations for a number of years, JLARC staff estimated Virginia's likely allocation of these revenues. JLARC staff assumed that Virginia would continue to receive an average of \$34 million per year. This provides a conservative estimate of anticipated revenues because no attempt was made to increase this figure to reflect anticipated inflation.

The final difference between the two revenue assessments is that VDOT used trend line analysis to predict future revenue growth. Because the level of transportation revenues is impacted by economic cycles more than long-term growth trends, JLARC staff determined that a more accurate estimate of future growth would come from applying the average growth from the first six years of the estimate to the later years of the analysis period. The net result of these differing assumptions is that JLARC staff's revenue estimate is four percent higher.

Assumptions Regarding Expenditure Requirements. On the expenditure side, although the JLARC and VDOT staff assumptions did not differ dramatically, the cumulative effects of these differences over 20 years resulted in substantially different estimates of funding available for allocation among the interstate, primary, secondary and urban systems for construction projects. As with the assumptions regarding revenues, the majority of these differences were caused by VDOT's use of trend line analysis in contrast to JLARC staff's application of average annual growth to the later years of the analysis period.

For example, JLARC staff did not use VDOT's assumptions about maintenance costs. VDOT's future expenditure assumptions are based on linear trend analysis of forecast expenditures used in the development of the six-year plan. VDOT's FY 2001-2006 program included the assumption that maintenance would be flat for the final five years of the program. Basing trend line analysis on flat allocations results in an estimate that maintenance expenditures increase about one-third of one percent annually over 20 years.

However, VDOT's actual maintenance budget has increased an average of 3.2 percent annually over the last 10 years. Without any evidence to suggest that the rate of growth of maintenance expenditures would decline substantially, JLARC staff adjusted the VDOT forecast to reflect 3.2 percent annual growth in maintenance costs. As a result of the differing assumptions about maintenance costs, JLARC staff's forecast projects that maintenance expenditures over the next 20 years may be \$6 billion more than VDOT's forecast. The different assumptions regarding maintenance costs caused the greatest proportion of variation between the two forecasts.

In other areas, VDOT assumed that program levels would remain flat over the entire 20-year period. For example, VDOT's expenditure assumptions did not allow for any growth in some mandatory expenditure areas such as support to other State agencies. Similarly, VDOT's capital outlay program does not grow after FY 2003. In addition, VDOT did not project any growth in personal services beyond 2003. JLARC staff examined historic growth trends and

anticipated growth during the first six years of the analysis period to make more realistic estimates of growth in these areas.

Funding Available for Highway Systems Construction. The net result is that JLARC staff's forecast estimates \$26.4 billion will be available for construction allocations to the Interstate, primary, secondary and urban systems, including estimated PTF revenues and net FRANs proceeds, over the 20-year period. The VDOT forecast projects 16 percent more available for construction allocations, or \$30.6 billion. This is less than 35 percent of total revenues after funds are allocated to the other modes, maintenance, operations, administration and special programs.



NOV 20 2001

COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION

1401 EAST BROAD STREET
RICHMOND, 23219-2000

CHARLES D. NOTTINGHAM
COMMISSIONER

November 20, 2001

Mr. Philip A. Leone, Director
Joint Legislative Review and Audit Commission
Suite 1100
General Assembly Building
Capitol Square
Richmond, Virginia 23219

Dear Phil:

Thank you for affording VDOT an opportunity to review and respond to the exposure draft of JLARC's study *Equity and Efficiency of Highway Construction and Transit Funding*. I would like to extend my appreciation to you and your staff for your professionalism in data collection and analysis in preparing the draft.

Additionally, I would like to suggest the final report be enhanced by addressing VDOT concerns outlined in this correspondence. It is not easy to analyze a complex, multi-layered process for funding the construction of thousands of highway and transit projects worth billions of dollars from a combination of state and federal sources. To that end, VDOT is interested and supportive of the legislative examination of methods to ensure fairness and equity in transportation funding. The Department has done a good job with the available monies and the Commonwealth Transportation Board has worked to minimize any disparity in regional funding through its actions to program projects.

Your report contains 19 recommendations, some of which would alter the fundamental methods by which funds are currently distributed. The major recommendations of the report recommend:

- (1) Creating a new three-tier system for the allocation of highway funding;
- (2) Establishing seven funding regions;
- (3) Creating a separate bridge fund; and
- (4) Increasing funding and control of funding to localities.

WE KEEP VIRGINIA MOVING

(1) The type of three-tiered system proposed may well be beneficial to the Commonwealth. However, before the General Assembly makes the decision to amend the Code, a detailed analysis of funding under the proposed allocation system should be compared to the existing allocation system. Such an analysis will require additional data, which is not available in this report. JLARC's report indicated that an additional \$162 million is required to "hold harmless" all jurisdictions. The system you propose is still not a functional system, since functional classifications of roads are based on other characteristics besides traffic volumes.

In addition, should JLARC develop models to demonstrate the resulting allocation impact to jurisdictions under the proposed system, the Department's implementation costs should be analyzed. The Department is undertaking an analysis to determine the personnel and hours required to determine the impact of this proposal on localities and what would be required to implement the proposed system. A detailed and thorough evaluation of the recommendation cannot be given at this time.

(2) The proposal to establish seven funding areas may well be beneficial to the Commonwealth. In fact, Governor Gilmore's Commission on Transportation Policy (CTP) reported last year that the existing district lines are outdated, and should be examined by the General Assembly. However, before the General Assembly makes the decision to amend the Code, a detailed analysis of funding under the proposed seven regions should be compared to the existing allocation system. The proposed funding districts do not completely conform to PDC or MPO boundaries. Again, such an analysis would require additional data (e.g., mileage), which is currently unavailable. The analysis could combine both the three-tier allocation system and the seven-region structure in comparison with the existing method. Further, from VDOT's operational perspective, if the seven funding regions are adopted, some practical and logistical concerns exist. For example, existing district offices will face greater challenges to efficiently and effectively service the larger new region due to increased travel time. The budgetary and human impact of changing the existing district office locations will need to be evaluated.

The Department's primary concern is the basis for determining need and allocating funds. The Department's first challenge is to determine which roads fall into the proposed tiers. Second, the proposed model, HERS, identified to assist with needs assessment has some significant deficiencies. VDOT has been working diligently over the past year to update its databases and create an objective model that would provide a useful means of assessing the Commonwealth's highway needs.

The HERS model would have to be modified substantially for use in Virginia. Even with those modifications, there would be serious gaps in any needs assessment generated with the HERS model.

JLARC's representation is that the "needs assessment" was developed solely for the purpose of allocating funding between road systems. The legislation that originally mandated the needs assessment to be done, did not specify that it be used for funding allocation. The amendments to the legislation last year did not specify that the needs assessment be used for

allocation of funding among systems. And, the legislative changes proposed by JLARC do not specify that the needs assessment be used for the allocation of funding among systems. The fact of the matter is different groups have used the needs assessment tool for different purposes ever since it was created. Contrary to JLARC's characterization that VDOT has promoted the needs assessment as a "wish list," VDOT's efforts have been to develop a tool that would be applicable to all systems and provide accurate information for a variety of uses, including resource allocation.

The decisions as to whether VDOT should conduct a needs assessment, how that needs assessment should be developed, and what that needs assessment should be used for are policy decisions for the General Assembly, and VDOT welcomes its assistance and direction. VDOT supports the legislation enacted earlier this year to require a fully multimodal long-range planning document that is consistent with federal requirements.

At the same time, if, as JLARC recommends, it is the policy of the Commonwealth to develop a model that is a limited needs assessment tool used to allocate funds among systems, then there are other issues that would have to be addressed. For example, the Virginia Transportation Act of 2000 (VTA) already allocates a substantial portion of funds. Thus it would be necessary for the General Assembly to reconcile the modeled needs assessment and the VTA allocation.

(3) The purpose of a separate bridge fund is to provide an increased focus on bridge needs. We agree with the concept of increased emphasis on bridge needs. The Department disagrees with the concept of a separate fund as this will negatively impact our ability to use common business practices for cash management and may result in the delay or deletion of other highway projects. The same goal of emphasizing bridge projects can be achieved by specifying the amount that should be allocated annually to bridge projects in a manner similar to the current primary program or a specific amount can be specified.

VDOT does not accept the statement that the apportionment is reduced by \$12.7 million because of the transfer from bridge to other federal categories. Since Virginia is a donor state, any reduction of that magnitude would be offset by a corresponding Minimum Guarantee increase of 90.5% of the reduction. The Federal Highway Administration (FHWA) has assured VDOT that no net loss of federal funds has occurred due to VDOT's decision to re-program federal bridge funds to other worthy projects, rather than allowing these funds to lapse and go unspent in Virginia. This was a prudent and necessary business decision that has been routinely made by VDOT and many other state DOTs over the years.

(4) The report has several recommendations that cumulatively will grant localities greater portions of funding and the flexibility and authority to utilize funds as so determined. The Department agrees that localities should have the flexibility and authority to earmark funds locally, including for transit needs. In fact, they already have this ability, and there are many such examples of this in the Virginia Transportation Development Plan (VTDP). The Department's position is to ensure that allocated funds are spent on projects that best benefit the Commonwealth as a whole.

Mr. Philip A. Leone
November 20, 2001
Page 4

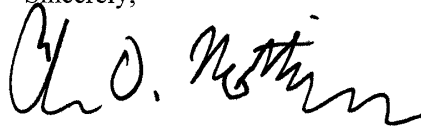
The Commission on Transportation Policy recommended that VDOT develop a system of prioritization, which has been completed with assistance by the Virginia Transportation Research Council. The Department has concerns about the potential shift of funds to major roads under the proposed funding recommendations at the expense of the local systems. The recently completed VDOT Customer Service Survey results (which can be made available upon request) indicate that 82% of Virginians are satisfied with VDOT's efforts on all roads and 77% are satisfied with VDOT's efforts on major highways. However, only 65% of Virginians are satisfied with efforts on the secondary system and only approximately 50% were satisfied with unpaved roads. - The University of Virginia Center for Survey Research conducted this survey for VDOT and it is available for your use.

Please note that a VDOT response to each recommendation as well as technical corrections are included in the appendices.

I am proud of the efforts VDOT has made to diligently follow the direction of the General Assembly and Governor as set out in the Code of Virginia. Should the legislature make any changes to the classification or formula systems, VDOT will carry through with those changes.

Again, thank you for allowing VDOT the opportunity to review the exposure draft. The entire staff of VDOT is ready to provide further assistance to you and your staff in finalizing the exposure draft. I look forward to working with you further.

Sincerely,

A handwritten signature in black ink, appearing to read "C. D. Nottingham", with a stylized, flowing script.

Charles D. Nottingham

Attachments

Cc: The Honorable Shirley J. Ybarra
Mr. C. D. Garver, Jr.
Mr. A. V. Bailey, II
Mr. C. Frank Gee
Mr. J. C. Southard
Mrs. C. S. Sorrell
Mr. G. A. Whirley, Sr.
Mr. D.R. Askew
Mr. T. F. Boyd
Dr. B. D. Hill
Dr. G. R. Allen



COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION

1401 EAST BROAD STREET
RICHMOND, 23219-2000

CHARLES D. NOTTINGHAM
COMMISSIONER

November 28, 2001

Mr. Philip A. Leone, Director
Joint Legislative Review and Audit Commission
Suite 1100
General Assembly Building
Capitol Square
Richmond, Virginia 23219

Dear Phil:

This letter is sent as a follow-up to the report entitled *Equity and Efficiency of Highway Construction and Transit Funding*, which is currently being prepared for release in its final form. By correspondence dated November 20, 2001, VDOT submitted comments on general issues raised in the exposure draft, as well as a list of technical corrections. From discussions with staff, I understand that several of our technical corrections have been addressed by your office. I have attached updated Appendices 1 and 2 to reflect these changes. Please include these documents in the final report as VDOT's formal response.

Again, I wish to express my appreciation for the opportunity to comment on the exposure draft. I also appreciate the thorough review of our documents by your staff, as well as the collegial interaction we have maintained. Please let me know if VDOT or I can be of further assistance.

Sincerely,

A handwritten signature in black ink, appearing to read "C. D. Nottingham", with a stylized flourish at the end.

Charles D. Nottingham

Attachment

Mr. Philip A. Leone
November 28, 2001
Page 2

cc: The Honorable Shirley J. Ybarra
Mr. C. D. Garver, Jr.
Mr. A. V. Bailey, II
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Mr. J. C. Southard
Mrs. C. S. Sorrell
Mr. G. A. Whirley, Sr.
Mr. D.R. Askew
Mr. T. F. Boyd
Dr. B. D. Hill
Dr. G. R. Allen

Appendix 1
Equity and Efficiency of Highway Construction and Transit Funding
November 28, 2001
By Joint Legislative Audit and Review Commission

VDOT Response

JLARC Recommendation 1:

The General Assembly may wish to consider amending Articles 1.1 and 2 of Title 33.1 of the *Code of Virginia* to repeal the current administrative classification system and establish a new three-tier system for the allocation of highway construction funds that consists of statewide, regional, and local systems based on the federal road classification system.

VDOT Response:

The type of three-tiered system proposed may well be beneficial to the Commonwealth. However, before the General Assembly makes the decision to amend the Code, a detailed analysis of funding under the proposed allocation system should be compared to the existing allocation system. The report noted that an additional \$162 million would be required to “hold harmless” all jurisdictions, but did not include any allowances for implementation costs to the Department. In fact, the Department is undertaking an analysis to determine the labor hours required to implement the proposed system. Therefore, a detailed and thorough evaluation of the proposal cannot be given at this time.

JLARC Recommendation 2:

The General Assembly may wish to consider amending Articles 1.1 and 2 of the Title 33.1 of the *Code of Virginia* to specify that the Commonwealth Transportation Board shall have the authority to allocate statewide system funds at the project level based on system priorities, and the authority to allocate regional system funds at the project level in coordination with local governments, and where appropriate, regional bodies within the region impacted. The General Assembly may wish to further specify that local governments shall have the authority to allocate all local system funds based on local priorities.

VDOT Response:

Localities currently have the authority to allocate local system funds based on their own perception of priority. Through the system of annual pre-allocation hearings, consultations with resident engineers to establish secondary road improvement plans, and various grant programs established by statute (e.g., revenue sharing), localities already have significant control over funding decisions. Implementing the recommendation might diminish the traditional focus of the Commonwealth Transportation Board (CTB) on statewide needs. The CTB currently has a statutory duty to “be mindful of the best

interest of the Commonwealth at large primarily instead of the district from which chosen or the transportation interest represented.”

JLARC Recommendation 3:

The General Assembly may wish to consider establishing seven funding regions based on metropolitan planning organizations and major transportation corridors and require that regional system construction funds be allocated among the regions instead of among the existing Virginia Department of Transportation districts.

VDOT Response:

As with Recommendation 1, this proposal may well be beneficial to the Commonwealth. Reevaluating the district structure was a recommendation made by the Commission on Transportation Policy (CTP). However, before the General Assembly makes the decision to amend the Code, a detailed analysis of funding under the proposed seven regions should be compared to the existing allocation system. Such an analysis would require additional data (e.g., mileage) which is currently unavailable. The analysis could combine both the three-tier allocation system and the seven-region structure in comparison with the existing method. Even if this analysis determines some benefits, VDOT may incur additional costs in actually changing its physical plant, moving staff and other resources to implement the recommendation (for example, travel times may require relocation of facilities). Therefore, a detailed and thorough evaluation of the proposal cannot be given at this time.

JLARC Recommendation 4:

The General Assembly may wish to consider amending §33.1-2 of the *Code of Virginia* to repeal the requirement that there be one Commonwealth Transportation Board member appointed from each of the nine construction districts and to instead require that one member be appointed from each of the seven new funding regions.

VDOT Response:

If the General Assembly alters the number of construction districts, then it would make sense to adjust the number of district representatives on the CTB.

JLARC Recommendation 5:

The Commonwealth Transportation Board should rescind the provisions of the 1987 Board resolution that limits expenditures of urban funds by cities and towns to arterial and collector roads and adopt a resolution that gives cities and towns the authority to spend local system funds on any local streets and collectors.

VDOT Response:

Implementation of this recommendation would limit the ability of the CTB to fulfill its statutory duty referenced in VDOT Response to Recommendation 2. From a policy standpoint, the General Assembly, CTB and the Department must weigh the benefits of giving greater control over transportation funding decisions to localities with the types of recommendations (such as some from the *Adequacy and Management of VDOT's Highway Maintenance Program*) that suggest VDOT establish greater monitoring and standards and criteria for maintenance activities performed at the local level. These types of recommendations are largely incompatible. Some localities may be unable to assume the level of control over their transportation systems, or may fail to meet minimum acceptable standards. In these cases, greater control would be necessary. However, other localities may find this degree of external oversight to be unnecessary, if not inefficient and costly. The current method offers a combination of local and statewide input. We recognize that no process is perfect and improvements are possible. The crucial question for public policymakers is to determine the optimal combination of centralized and decentralized control over transportation systems, and the costs required to implement these new processes.

JLARC Recommendation 6:

The General Assembly may wish to consider amending §33.1-23.02 of the *Code of Virginia* to specify the purposes of the quinquennial needs assessment and require VDOT to use an objective, measurable tool, such as HERS or an equivalent, for the identification highway deficiencies.

VDOT Response:

VDOT has been working diligently over the past year to update its databases and create an objective model that would provide a useful means of assessing the Commonwealth's highway needs.

JLARC's representation is that the "needs assessment" was developed solely for the purpose of allocating funding between road systems. The legislation that originally mandated the needs assessment to be done, did not specify that it be used for funding allocation. The amendments to the legislation last year did not specify that the needs assessment be used for allocation of funding among systems. And, the legislative changes proposed by JLARC do not specify that the needs assessment be used for the allocation of funding among systems. The fact of the matter is, the needs assessment tool has been used by different groups for different purposes ever since it was created.

Contrary to JLARC's characterization that VDOT has promoted the needs assessment as a "wish list," VDOT's efforts have been to develop a tool that would be applicable to all

systems and provide accurate information for a variety of uses, including resource allocation.

The HERS model recommended by JLARC has some serious limitations, and would have to be modified substantially for use in Virginia. Even with those modifications, there would be serious gaps in any needs assessment generated with the HERS model.

The decisions as to whether VDOT should conduct a needs assessment; how that needs assessment should be developed; and, what that needs assessment should be used for are policy decisions where VDOT would welcome direction from the General Assembly.

At the same time, if, as JLARC recommends, it is the policy of the Commonwealth to develop a model that is a limited needs assessment tool and to use that needs assessment to allocate funds among systems and regions, then there other issues that would have to be addressed. For example, the VTA already allocates a substantial portion of funds. Thus it would be necessary for the General Assembly to reconcile the modeled needs assessment and the VTA allocation.

JLARC Recommendation 7:

The Virginia Department of Transportation should increase the number of highway section samples that are collected as part of future Highway Economic Requirements System needs assessments to ensure that samples are representative of road needs in each functional classification and jurisdiction.

VDOT Response:

The Department intends to continue its long-term evaluation of HERS, and exchange information with the FHWA and other state DOTs to refine the model. A concerted effort at the state DOT and federal level should accelerate the further development of the model.

JLARC Recommendation 8:

The General Assembly may wish to consider amending Article 1.1 of Title 33 of the *Code of Virginia* to require that State and federal highway construction funds, with certain specific exceptions, be allocated among the statewide, regional, and local systems based on the proportional highway construction needs of each system.

VDOT Response:

The Department feels this recommendation requires further analysis to ensure this can be accomplished as stated. Based on the Department's interpretation of the recommendation, the number of exceptions would be great. A large portion of current

federal apportionments is comprised of earmarks for priority projects such as the Woodrow Wilson Bridge. Other federal funds have defined purpose (e.g., CMAQ) or are directed by the MPOs. If this were directed too broadly, there may not be funds available to spend where appropriated.

JLARC Recommendation 9:

The Commonwealth Transportation Board should allocate statewide system funds on a project-by-project basis based on a prioritization of statewide system needs.

VDOT Response:

This recommendation appears to be predicated on the adoption of the proposed functional classification system. Therefore, its implementation would depend on whether the proposal is accepted.

The CTB already follows a prioritized model to allocate funds, using factors such as population, land area, vehicle miles traveled, or lane miles. At the recommendation of the Commission on Transportation Policy (CTP) the General Assembly enacted an amendment to § 33.1-12 of the Code of Virginia directing that the CTB recommend objective criteria that it could use in selecting those transportation projects to be advanced from the feasibility to the construction stage. If these criteria were enacted into law, they would apply equally to the interstate, primary, and urban systems of highways. Implementing this recommendation should be deferred until the General Assembly has an opportunity to evaluate the findings of the CTB.

JLARC Recommendation 10:

The General Assembly may wish to consider requiring that regional system funds be allocated among the seven proposed funding regions based on the total registered vehicles in each funding region.

VDOT Response:

By basing the local distribution system on centerline miles and registered vehicles, the effects of terrain (e.g., mountains) and the cost of construction and relocation of public utilities are not considered. In addition, registered vehicles may not be indicative of proportional road use. These factors could result in substantially higher construction costs. This would mean that the funds allocated would go further toward meeting needs in some regions than others.

JLARC Recommendation 11:

The General Assembly may wish to consider requiring that 86 percent of local system funds be allocated among counties, cities, and towns based on each locality's proportion of local system centerline miles, and 14 percent of local system funds be allocated based on each locality's proportion of total registered vehicles.

VDOT Response:

By basing the local distribution system on centerline miles and registered vehicles, the effects of terrain (e.g., mountains), the cost of construction and relocation of public utilities are not considered. In addition, registered vehicles may not be indicative of proportional road use. These factors could result in substantially higher construction costs. If the recommendation is implemented, the definition of towns needs clarification, since the report did not state if a town should have a population greater than 3,500 to receive a separate allocation.

JLARC Recommendation 12:

The General Assembly may wish to consider giving counties greater flexibility in meeting local road needs by combining local system and unpaved road funds in a single fund.

VDOT Response:

VDOT supports this recommendation, and notes that it is consistent with the Commission on Transportation Policy (CTP) recommendation last year for VDOT to allow local governments more authority over local road decisions. JLARC does not specify whether this recommendation eliminates the mandatory set aside of 5.67% for unpaved roads. In a statewide customer survey conducted in the winter of 2001, VDOT customers reported an overall satisfaction level of 82 per cent with VDOT's efforts on all roads. On major roads they reported a satisfaction level of 77 per cent, and on secondaries, there was a satisfaction level of 65 per cent. For unpaved roads, the customer satisfaction level fell to slightly more than 50 per cent.

JLARC Recommendation 13:

The General Assembly may wish to consider amending Article 1.1 of Title 33 of the *Code of Virginia* to require VDOT to place federal highway bridge replacement and rehabilitation funds into a separate State bridge fund and allocate these funds using a prioritization system based on the severity of each bridges deficiency.

VDOT Response:

The purpose of a separate bridge fund is to provide an increased focus on bridge needs. VDOT agrees with the concept of increased emphasis on bridge needs. However, the Department disagrees with the concept of a separate fund, as this will negatively impact our ability to use common business practices for cash management and may result in the delay or deletion of other highway projects. The same goal of emphasizing bridge projects can be achieved by specifying the amount that should be allocated annually to bridge projects in a manner similar to the current primary program or a specific amount can be specified.

VDOT does not accept the statement that the apportionment is reduced by \$12.7 million because of the transfer from bridge to other federal categories. Since Virginia is a donor state, any reduction of that magnitude would be offset by a corresponding Minimum Guarantee increase of 90.5% of the reduction. The Federal Highway Administration (FHWA) has assured VDOT that no net loss of federal funds has occurred due to VDOT's decision to re-program federal bridge funds to other worthy projects, rather than allowing these funds to lapse and go unspent in Virginia. This was a prudent and necessary business decision that has been routinely made by VDOT and many other state DOTs over the years.

JLARC Recommendation 14:

The General Assembly may wish to amend §33.1-1 of the *Code of Virginia* to provide for General Assembly appointment of the five at-large Commonwealth Transportation Board members.

VDOT Response:

Direct appointment of CTB members by the General Assembly does not directly address any funding, equity, or efficiency issues. There is no evidence that CTB members appointed by a Governor and confirmed by the General Assembly, are unresponsive to the General Assembly. Selecting new transportation routes and approving VDOT's operating budget are quintessentially executive functions that, under long-standing separation of powers doctrine, are best left in the hands of the executive branch. A hybrid system of legislative and executive branch appointments would make it more difficult for taxpayers to hold the executive branch accountable for successes and failures by the CTB and VDOT. Finally, the General Assembly would become burdened by highway location decisions, and the resulting controversy and litigation that so often is associated with these decisions.

The General Assembly, through legislative action, already has the ability to influence transportation decisions, such as those made pursuant to the Virginia Transportation Act of 2000. Members can and do interact with VDOT and the CTB routinely in addressing constituent concerns, providing input during pre-allocation hearings, and working with

other branches of state government. Therefore, there are already many avenues by which the General Assembly can influence transportation-related decisions in a meaningful and significant way.

JLARC Recommendation 15:

The General Assembly may wish to consider restoring the Commonwealth Transportation Board's role in project selection by amending the Virginia Transportation Act to remove those provisions that limit the Board's flexibility to program construction revenues made available by the Virginia Transportation Act in accordance with the State allocation formula.

VDOT Response:

VDOT supports any recommendation that expands the flexibility and freedom of action of the citizen members of the CTB in making transportation decisions. Increased flexibility in this area would allow more projects to move forward, while optimizing cash flow management.

JLARC Recommendation 16:

The General Assembly may wish to consider amending the *Code of Virginia* to establish an intermodal office within the transportation secretariat that is staffed by professionals, including a director who is appointed by the Commonwealth Transportation Board. The intermodal office would be responsible for advising the Secretary of Transportation and the Commonwealth Transportation Board on intermodal issues.

VDOT Response:

VDOT supports this recommendation. Additional staff in the Office of the Secretary should also be authorized to focus on Public-Private Transportation Act (PPTA) proposals and related policy.

JLARC Recommendation 17:

To enhance the intermodal role of the Office of the Secretary of Transportation, the Governor and the Secretary of Transportation may wish to consider moving the Office of the Secretary to a location physically separate from all of the agencies within the transportation secretariat.

VDOT Response:

VDOT has greatly benefited from the close proximity of the Secretary's Office to its executive and senior management staffs. This proximity facilitates rapid exchange of information, and ensures communications among personnel occur freely. Furthermore, VDOT has also been the beneficiary of the advice and guidance of the Secretary on multi-modal issues. Physically relocating the Secretary would deprive VDOT of this vital resource.

JLARC Recommendation 18:

The General Assembly may wish to consider amending §33.1-1 of the *Code of Virginia* to require that the vice-chair of the Commonwealth Transportation Board be selected from among the voting members of the Board by a majority of the voting members of the Board.

VDOT Response:

Since most of the decisions the CTB makes pertain to VDOT and its activities, it is reasonable for the Vice-Chairman to be the executive head of the Department. Furthermore, there is no evidence that the CTB or the Commonwealth have suffered from having the Commissioner serve in this capacity. Due to his direct experience with VDOT operations, one could conclude that this relationship has been mutually beneficial. Finally, having the Commissioner serve as Vice-Chairman of the CTB lends additional prestige to the position, which enhances the Commonwealth's ability to recruit the most highly qualified candidate for the job.

The Commonwealth Transportation Commissioner position is referenced often in the Code of Virginia, and is given extensive authority in the Code. There is no evidence that the existing Vice-Chairman designation in the Code has resulted in any funding, equity, or efficiency problems.

Appendix 2 – Technical Corrections – November 28, 2001
Virginia Department of Transportation’s Response To JLARC Report
Equity and Efficiency of Highway Construction and Transit Funding
(Note: Page references, etc. refer to the exposure draft)

Page	JLARC Recommendation # /Comment/ Issue	VDOT Clarification/Comment
III	Funding Paragraph 2 New Classification System Should Serve as Basis for the Allocation of Highway Construction Funds.	<p>The current highway network is based upon a functional classification system that is re-evaluated every 10 years after completion of the census. This system is predicated upon adopted national engineering principles. The proposed three-tier system would not be consistent with the factors used in the computer forecasting models and effectively creates another categorical element for tracking.</p> <p>The proposed three-tier system could be considered as a replacement for the funding process that directs money to the interstate and primary systems, and then the secondary system. However, it would not have any utility in replacing the existing functional classification system that is used. The premise in the author’s writing is that the high volumes of traffic on some of the lower level functional classifications warrant a new classification system. This hypothesis mixes the function classification of a road and the traffic volume, which is erroneous. The function of a road is exclusive of volume, it is based upon the type of trip that uses that facility.</p> <p>The type of three-tiered system proposed may well be beneficial to the Commonwealth. However, before the General Assembly makes the decision to amend the Code, a detailed analysis of funding under the proposed allocation system should be compared to the existing allocation system. The report noted that an additional \$162 million would be required to “hold harmless” all jurisdictions, but did not include any allowances for implementation costs to the Department. In fact, the Department is undertaking an analysis to determine the labor hours required to implement the proposed system. Therefore, a detailed and thorough evaluation of the proposal cannot be given at this time.</p>

Appendix 2 – Technical Corrections – November 28, 2001
Virginia Department of Transportation’s Response To JLARC Report
Equity and Efficiency of Highway Construction and Transit Funding
(Note: Page references, etc. refer to the exposure draft)

Page	JLARC Recommendation # /Comment/ Issue	VDOT Clarification/Comment
V	Funding Paragraph 1 New Funding Regions Should Be Established to Replace Existing VDOT Districts for Purposes of Distributing Regional Construction Funds.	<p>A chart illustrating the distribution of past funds based upon this proposal is needed for discussion purposes among the participants in the process to see how the overall funds would be redistributed. Figure 11 on page 96 and Table 12 on page 99 should provide a comparison using the proposed funding versus the existing funding.</p> <p>This proposal may well be beneficial to the Commonwealth. Reevaluating the district structure was a recommendation made by the Commission on Transportation Policy (CTP). However, before the General Assembly makes the decision to amend the Code, a detailed analysis of funding under the proposed seven regions should be compared to the existing allocation system. Such an analysis would require additional data (e.g., mileage) which is currently unavailable. The analysis could combine both the three-tier allocation system and the seven-region structure in comparison with the existing method. Even if this analysis determines some benefits, VDOT may incur additional costs in actually changing its physical plant, moving staff and other resources to implement the recommendation (for example, travel times may require relocation of facilities). Therefore, a detailed and thorough evaluation of the proposal cannot be given at this time.</p>

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Equity and Efficiency of Highway Construction and Transit Funding
(Note: Page references, etc. refer to the exposure draft)

Page	JLARC Recommendation # /Comment/ Issue	VDOT Clarification/Comment
V	Needs Assessment Paragraph 2 VDOT Should Adopt an Objective and Accurate Needs Assessment	<p>JLARC’s representation is that the “needs assessment” was developed solely for the purpose of allocating funding between road systems. The legislation that originally mandated the needs assessment to be done, did not specify that it be used for funding allocation. The amendments to the legislation last year did not specify that the needs assessment be used for allocation of funding among systems. And, the legislative changes proposed by JLARC do not specify that the needs assessment be used for the allocation of funding among systems. The fact of the matter is, the needs assessment tool has been used by different groups for different purposes ever since it was created.</p> <p>Contrary to JLARC’s characterization that VDOT has promoted the needs assessment as a “wish list,” VDOT’s efforts have been to develop a tool that would be applicable to all systems and provide accurate information for a variety of uses, including resource allocation.</p> <p>The HERS model recommended by JLARC has some serious limitations, and would have to be modified substantially for use in Virginia. Even with those modifications, there would be serious gaps in any needs assessment generated with the HERS model.</p> <p>The decisions as to whether VDOT should conduct a needs assessment; how that needs assessment should be developed; and, what that needs assessment should be used for are policy decisions where VDOT would welcome direction from the General Assembly.</p>
VII	Needs Assessment VDOT has been reluctant to fulfill the legislative requirement that the quinquennial needs assessment be developed and released.	The needs assessment has been submitted to the General Assembly by the Secretary of Transportation as required.

Appendix 2 – Technical Corrections – November 28, 2001
Virginia Department of Transportation’s Response To JLARC Report
Equity and Efficiency of Highway Construction and Transit Funding
(Note: Page references, etc. refer to the exposure draft)

Page	JLARC Recommendation # /Comment/ Issue	VDOT Clarification/Comment
X	Needs Assessment Paragraph 1 “using a combination of centerline miles... and total registered vehicles appears to be the best proxy for predicting need on the local system.”	By basing the local distribution system on centerline miles and registered vehicles, the effects of terrain (mountains), right of way costs, and public utilities are not considered. These factors could result in substantially higher construction costs.
XI	Needs Assessment Paragraph 1 The Urban local needs are traditionally underreported as the figures usually only include those local roads on which street payments are made.	This leaves out an important element and results in short-changing the urban local needs.
XI	Bridge Needs Assessment Paragraph 1 Separate Bridge Fund Is Needed and Bridge Replacements Should Have Higher Priority	<p>This section needs to be coordinated with the response for the same issue in the JLARC document <i>Adequacy and Management of VDOT’s Highway Maintenance Program</i>. See pages 66-75. Exhibit 9 of the same illustrates the FHWA rating system. In NONE of the categories used in ranking the condition of the bridges does the word “deficient” appear. In NONE of the categories used in the ranking of the condition of the bridges does the word “replacement” appear.</p> <p>The subject study identifies 1,340 bridges needing replacement (page 113). The JLARC document <i>Adequacy and Management of VDOT’s Highway Maintenance Program</i> identifies 4,658 bridges needing repair. The discrepancy in these figures needs to be resolved.</p> <p>When the Bridge Management System in IMMP is fully operational, VDOT will better able to use the available data to prioritize resources.</p>

Appendix 2 – Technical Corrections – November 28, 2001
Virginia Department of Transportation’s Response To JLARC Report
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Page	JLARC Recommendation # /Comment/ Issue	VDOT Clarification/Comment
XV	Planning Paragraph 2 Intermodal Transportation Planning is Needed to Ensure Informed Funding Decisions	VDOT supports this recommendation. Additional staff in the Office of the Secretary should also be authorized to focus on Public-Private Transportation Act (PPTA) proposals and related policy.
3	Funding	Certain discrete funds exist (CMAQ, Forest Highway, etc.). However, the conclusion that more than one allocation process exists is inaccurate. Only one formula exists, defined by the General Assembly, but not all funds are distributed by that formula.
19	Analysis of HERS Paragraph 2	The analysis states that, among other factors, HERS uses pavement condition and roadway geometrics to determine deficiencies. The use of pavement condition may be considered a double-counting, since the same data should be used for determining maintenance (rather than construction) funding. Additionally, “roadway geometrics” is shown as an “objective” criterion, which is not really accurate. True, there are standards for width and horizontal alignment compared to speed and volume, but the very selection of these as the items to look at shows a kind of subjective bias since there are many other factors that could also be looked at—specifically shoulder and clear zone widths (which may be much better predictors of roadway safety).
35	Road Classification Paragraph 1 states “...the NHS system is a functionally based system and is primarily comprised of the interstate roads and other principal arterial roadways in the state.”	The NHS system is not a functionally based system, but rather another administrative system, as is evident from the information shown in Table 6 (page 85). The only nationally recognized functional system is the federal Functional Classification System.

Appendix 2 – Technical Corrections – November 28, 2001
Virginia Department of Transportation’s Response To JLARC Report
Equity and Efficiency of Highway Construction and Transit Funding
(Note: Page references, etc. refer to the exposure draft)

Page	JLARC Recommendation # /Comment/ Issue	VDOT Clarification/Comment
40	Funding Recommendation 2	Localities currently have the authority to allocate local system funds based on their own perception of priority. Through the system of annual pre-allocation hearings, consultations with resident engineers to establish secondary road improvement plans, and various grant programs established by statute (e.g., revenue sharing), localities already have significant control over funding decisions. Implementing the recommendation might diminish the traditional focus of the Commonwealth Transportation Board (CTB) on statewide needs. The CTB currently has a statutory duty to “be mindful of the best interest of the Commonwealth at large primarily instead of the district from which chosen or the transportation interest represented.”
41	Funding Paragraph 1 Seven Funding Regions Should Be Created - the last sentence of this paragraph states that the eastern shore does not have any regional system roads.	However, this area is placed in the Rappahannock Region. It would seem to make more sense to keep in the Hampton Roads Region since it is directly connected to that region.
47	CTB Meetings Paragraph just before recommendation	Text does not acknowledge that the CTB does this already through the pre-allocation hearings, nor does it mention that the Northern Virginia member chairs the TCC. Text also does not indicate any need for increased public input.
49	Funding First sentence: “the local government should have the flexibility to spend allocated funds on transit.”	The municipalities already have the flexibility to spend urban allocations on transit projects and there are numerous examples in the VTDP.
VIII and 66	Needs Assessment The HERS/ST model could be used to conduct an objective needs assessment of Virginia’s transportation needs.	Two states are using this model. The use of this software may be inconsistent with the current department information technology ideology (Synergy) of not creating “stovepipe” systems, and trying to share information. Much of the information needed in this system concerning lane widths and geometrics could be available through the Integrated Maintenance Management Program.

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67	Needs Assessment General Comment on HERS	<p>The HERS model recommended by JLARC has some serious limitations, and would have to be modified substantially for use in Virginia. Even with those modifications, there would be serious gaps in any needs assessment generated with the HERS model.</p> <p>The decisions as to whether VDOT should conduct a needs assessment; how that needs assessment should be developed; and, what that needs assessment should be used for are policy decisions where VDOT would welcome direction from the General Assembly.</p> <p>At the same time, if, as JLARC recommends, it is the policy of the Commonwealth to develop a model that is a limited needs assessment tool and to use that needs assessment to allocate funds among systems and regions, then there other issues that would have to be addressed. For example, the VTA already allocates a substantial portion of funds. Thus it would be necessary for the General Assembly to reconcile the modeled needs assessment and the VTA allocation.</p>
70	Needs Assessment Paragraph 1	The model could serve as a tool to integrate professional engineering experience and expertise, and economic analysis.
89	Funding Recommendation 8	The Department feels this recommendation requires further analysis to ensure this can be accomplished as stated. Based on the Department’s interpretation of the recommendation, the number of exceptions would be great. A large portion of current federal apportionments is comprised of earmarks for priority projects such as the Woodrow Wilson Bridge. Other federal funds have defined purpose (e.g., CMAQ) or are directed by the MPOs. If this were directed too broadly, there may not be funds available to spend where appropriated.
92	Funding Paragraph 2 - States that "...population and land area are the factors used to distribute secondary and urban funds.	This is not correct for urban construction allocations; population is the only factor.

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103	Needs Assessment Recommendation 11	By basing the local distribution system on centerline miles and registered vehicles, the effects of terrain (e.g., mountains), the cost of construction and relocation of public utilities are not considered. In addition, registered vehicles may not be indicative of proportional road use. These factors could result in substantially higher construction costs. If the recommendation is implemented, the definition of towns needs clarification, since the report did not state if a town should have a population greater than 3,500 to receive a separate allocation.
105	Funding Recommendation 12	VDOT supports this recommendation, and notes that it is consistent with the Commission on Transportation Policy (CTP) recommendation last year for VDOT to allow local governments more authority over local road decisions. JLARC does not specify whether this recommendation eliminates the mandatory set aside of 5.67% for unpaved roads. In a statewide customer survey conducted in the winter of 2001, VDOT customers reported an overall satisfaction level of 82 per cent with VDOT’s efforts on all roads. On major roads they reported a satisfaction level of 77 per cent, and on secondaries, there was a satisfaction level of 65 per cent. For unpaved roads, the customer satisfaction level fell to slightly more than 50 per cent.
111	Funding Separate bridge fund	<p>The purpose of a separate bridge fund is to provide an increased focus on bridge needs. VDOT agrees with the concept of increased emphasis on bridge needs. However, the Department disagrees with the concept of a separate fund, as this will negatively impact our ability to use common business practices for cash management and may result in the delay or deletion of other highway projects. The same goal of emphasizing bridge projects can be achieved by specifying the amount that should be allocated annually to bridge projects in a manner similar to the current primary program or a specific amount can be specified.</p> <p>VDOT does not accept the statement that the apportionment is reduced by \$12.7 million because of the transfer from bridge to other federal categories. Since Virginia is a donor state, any reduction of that magnitude would be offset by a corresponding Minimum Guarantee increase of 90.5% of the reduction. The Federal Highway Administration (FHWA) has assured VDOT that no net loss of federal funds has occurred due to VDOT’s decision to re-program federal bridge funds to other worthy projects, rather than allowing these funds to lapse and go unspent in Virginia. This was a prudent and necessary business decision that has been routinely made by VDOT and many other state DOTs over the years.</p>
	Definition	This report used FHWA definitions to define deficient bridges, which is different than that used in the Maintenance Report.



COMMONWEALTH of VIRGINIA

LEO J. BEYON
DIRECTOR

DEPARTMENT OF RAIL AND PUBLIC TRANSPORTATION
1313 EAST MAIN STREET, SUITE 300
P.O. BOX 590
RICHMOND, VA 23218-0590

(804) 786-4440
FAX (804) 786-7286
VIRGINIA RELAY CENTER
1-800-828-1120 (TDD)

NOV 20 2001

November 15, 2001

Mr. Philip A. Leone
Director
Joint Legislative Audit and Review Commission
Suite 1100, General Assembly Building
Richmond, Virginia 23219

Dear Mr. Leone,

Thank you for the opportunity to review chapter V of the exposure draft of JLARC's report Equity and Efficiency of Highway Construction and Transit Funding. The report accurately describes the status of funding for public transportation in Virginia although we do have a couple of technical corrections to offer. Our comments are as follows.

Page 155 Operating Revenues – The discussion of fare box revenues does not recognize the important role that fare policy often plays in achieving specific policy objectives. Typically, transit fares are set at a level where the amount that riders must pay is set as a function of fare elasticity – the point at which fare income starts to drop because of lost ridership. However, often fares are set at low levels or no fare is collected at all in order to achieve the highest ridership possible. Examples of this include downtown circulator routes, special transit services operated during highway construction and transit services operated for major events. These are examples where a high priority is set on reducing automobile usage. Free or low fares also are offered for routes that serve local priorities such as transporting students on college campuses and providing services for the elderly or disabled.

Page 157 State Assistance – The discussion of the State Formula Assistance Program needs to be updated. Legislation passed in 2001 has modified the state participation levels in the three categories of eligible expenses. In fiscal year 2003, the state participation ratio for administration, ridesharing, and fuel, tires and maintenance parts and supplies becomes uniform for all three categories at 95%. The problem of transit systems being unable to receive their nominal percentage of operating expenses will be corrected with this change - including the Virginia Railway Express.

Leading Virginia To Greater Mobility

Please let me know if you have any questions or if additional information is needed.

Sincerely,

A handwritten signature in black ink, appearing to read 'Leo J. Bevon', with a stylized flourish at the end.

Leo J. Bevon

JLARC
Suite 1100
General Assembly Building
Capitol Square
Richmond, Virginia 23219
(804) 786-1258 Fax: 371-0101
<http://jlarc.state.va.us>

